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THE PUPILS' ARITHMETIC

PRIMARY BOOK

PART ONE



THE MACMILLAN COMPANY

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THE PUPILS' ARITHMETIC

PRIMARY BOOK

PART ONE

1

BY

JAMES C. BYRNES, B.S., Ph.M.

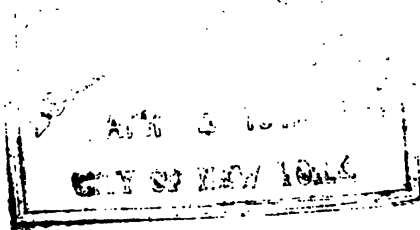
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PREFACE

THE PUPILS' ARITHMETIC is an effort to meet current criticism of methods and results in the teaching of elementary arithmetic.

The manner in which the authors plan to regain for our schools that mechanical skill in computation which characterized an older time, while retaining what is valuable in modern theory and practice, is aptly epitomized in the title,—THE PUPILS' ARITHMETIC.

Part One covers the work of the first three years of school; Part Two, the work of the fourth year.

The authors have made prominent the following features:

I. A large number of exercises in pure arithmetic, affording abundant practice in the mechanical operations.

II. A large number of problems in applied arithmetic, affording practice in gleaning thought from the printed page and in applying the arithmetical principles previously learned.

III. The careful grading of the exercises and

problems, the avoidance of long numbers and lengthy processes in problem work, the regular alternation of exercises in abstract number on the one hand, and concrete problems on the other. The exercises, both abstract and practical, have been devised and arranged for oral work, seat work, and class drill.

IV. The model solution of problems by the shortest and most direct of the approved methods of computation.

V. The variety and interesting character of the problems. Occasionally, the problems are grouped about a central idea. However, since such grouping, when forced, frequently leads the teacher away from her object, the authors have elected generally to classify the problems about the mathematical principle or process upon which their solution depends. In the problems almost every phase of life that attracts children is touched upon. Undue prominence is not given to problems in dollars and cents. The *idea of rate* is presented in its manifold aspects of consumption, expenditure, growth, speed, production, accretion, etc. The language used is simple though not childish; stereotyped forms of stating problems have been avoided. Many words and phrases which may require explanation are printed in italics. Such explanation, together with the reading aloud of problems, serves to remove those difficulties of

language which frequently are the real cause of an apparent weakness in arithmetic.

As a book of reference for pupils, the text possesses the following advantages:

I. A simple inductive treatment of the explanations of principles and processes. Clearness is sought through the aid of pictures and diagrams.

II. Model forms of computation suitable for use in both school and office. Mathematical precision of statement has been jealously guarded.

III. A topical arrangement of the subject-matter and a series of cross-references to show the interrelation of topics.

These features are fundamental in a text-book designed for the use of children; they cannot be incorporated in any book based upon the spiral system. Practical teachers will perceive that these features render this book as valuable for the use of teachers as for the use of pupils. To the grade teacher, texts arranged on the spiral plan seem to be without order. Nowhere can she find a complete treatment of any one topic. As a guiding principle in a course of study in arithmetic the spiral plan is entirely sound in principle and practicable in operation, but it does not follow that a text-book presenting an author's interpretation and application of the spiral principle is adapted to all the varied courses of study in the many school systems of this country. Where several lines of work

are to be pursued at once they will inevitably cross and recross one another at different points according to the individual judgment and taste of the superintendent who plans the course of study and the teacher who interprets it. Both teacher and pupil are bewildered if the text-book arranged according to the spiral plan does not conform to the course of study based on that system. In any case the topics treated in such a text are not orientated with respect to one another or with respect to the individual teacher's term plan. This lack of definiteness in arrangement produces a corresponding lack of definiteness in teaching. For these reasons the work submitted herewith, though arranged on the topical plan, is adapted for use in school systems having the spiral system in arithmetic as well as for school systems following the traditional order of topics, but it leaves to each teacher the arrangement of the details of her term plan, within the limits prescribed by the course of study.

THE AUTHORS.

NEW YORK, April, 1909.

CONTENTS

	PAGE
I. ADDITION	1
II. SUBTRACTION	22
III. MULTIPLICATION	54
IV. DIVISION	108
V. FRACTIONS	159
VI. MEASURES	200


PRIMARY ARITHMETIC

PART ONE

ADDITION

Introduction

1. Count to ten.

2.  1. Put down 5 splints. Add 1 more. How many are there? Continue to add 1 more until you reach 10.

3. Add at sight and learn:

1	2	3	4	5	6	7	8	9
<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

When 5 splints and 1 splint are grouped together, and counted, the answer, 6, is called the *sum* of 5 and 1.

4. Put down 1 splint. Add 2 more splints. Continue to add 2 more splints until you reach 11.

5. Put down 2 splints. Add 2 more splints. Continue to add 2 more splints until you reach 10.

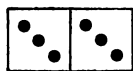
6. Find the sums and learn:

1	2	3	4	5	6	7	8	9
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

We may say 1 plus 2 equals 3. We write this $1 + 2 = 3$. The sign $+$ is called *plus*; it means *and*; it is used between numbers that are to be added together. The sign $=$ means *equals*.

7. What does $2 + 3$ mean? What does $2 + 3 = 5$ mean?

8. Write the sum after the sign $=$ in each example:



$2 + 3 =$

$2 + 3 =$

$3 + 3 =$

$3 + 3 =$

9. Make similar pictures for these sums and write the answers:

$3 + 4 = ?$

$6 + 3 = ?$

$8 + 3 = ?$

$3 + 5 = ?$

$7 + 3 = ?$

$9 + 3 = ?$

Use this form:

3

3

3

3

4567

10. Draw a line 3 inches long; add to it a line 2 inches long. Measure the length of the new line.

11. Copy these examples, filling in the blanks as you write:

$5 + ? = 6$

$2 + ? = 5$

$4 + ? = 7$

$4 + ? = 6$

$3 + ? = 5$

$1 + ? = 5$

$3 + ? = 6$

$3 + ? = 7$

$1 + ? = 4$

$2 + ? = 6$

$2 + ? = 7$

$1 + ? = 7$

$6 + ? = 6$

$7 + ? = 7$

$0 + ? = 5$

Exercises in Addition**Addition Drill by Decades**

Add at sight and memorize :

1	11	21	31	41	51	61	71	81	91
<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

1	11	21	31	41	51	61	71	81	91
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

1	11	21	31	etc.	[“etc.” means “and so on.” Therefore continue to 91 plus 3.]				
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>						

1	11	21	31		1	11	21	31	
<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	etc.	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	etc.

PROBLEMS—ORAL

1. Our class read 6 pages on Monday, 5 pages on Tuesday, and 7 pages on Wednesday. How many pages did we read in the three days?

2. We worked 8 examples in the morning and 7 examples in the afternoon. How many did we work during the day?

3. How many *absentees* were there during the week, if there were 3 on Monday, 1 on Tuesday, none on Wednesday and Thursday, and 2 on Friday?

4. Our class was perfect in *attendance* 8 days last month and 9 days this month. How many days of perfect attendance in both months?

WRITTEN EXERCISE

Add:

1. 67	2. 49	3. 68	4. 35	5. 45
38	63	45	70	63
<u> </u>	85	91	98	79
	<u> </u>	78	67	92
		<u> </u>	41	86
			<u> </u>	58
				<u> </u>

WRITTEN PROBLEMS

Thirty days has September,
 April, June, and November.
 All the rest have thirty-one
 Save February alone.
 Which has four and twenty-four,
 And every leap year one day more.

1. How many days in May, June, and July?
2. How many days in September, October, November, and December?

3. How many days from the beginning of January to the end of June (leap year)?

4. Tell the total number of days in February, March, August, and December.

5. There are 365 days in a year and 366 days in a leap year. How many days in the two years together?

SIGHT EXERCISE

Addition Drill by Decades

Add at sight and memorize:

1	11	21	31	41	51	61	71	81	91
6	6	6	6	6	6	6	6	6	6
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

1	11	21	31
7	7	7	7 etc.
<u> </u>	<u> </u>	<u> </u>	<u> </u>

1	11	21	31
8	8	8	8 etc.
<u> </u>	<u> </u>	<u> </u>	<u> </u>

1	11	21	31
9	9	9	9 etc.
<u> </u>	<u> </u>	<u> </u>	<u> </u>

SIGHT EXERCISE

Add at sight:

1. 6	2. 8	3. 9	4. 7	5. 5
7	6	8	9	8
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Add :

WRITTEN EXERCISE

1. 329	2. 293	3. 846	4. 907	5. 568
467	409	862	185	719
<u> </u>	685	209	456	306
		<u> </u>	798	755
			<u> </u>	<u> </u>

ORAL PROBLEMS

1. John went to hunt eggs in the barn. He found 3 eggs in one nest, 2 eggs in a second nest, and 1 egg in each of 5 other nests. How many eggs did he find?

2. He then counted the hens in the barnyard. There were 7 white hens, 9 black hens, and 5 speckled hens. How many hens did he see?

3. Then he looked for the chicks. One old hen had 7 little chicks, another hen had 6 chicks, and two other hens each had 3 chicks. How many chicks were there?

4. John watched the cows at *milking time*. The farmer filled three pails with milk. One held 12 quarts, one held 10 quarts, and one held 8 quarts. How much milk did he get?

5. John is 9 years old; the farmer is 21 years older than John. How old is the farmer?

WRITTEN PROBLEMS

1. A ship made a four days' trip. During the first day she sailed 257 miles, during the second 308 miles, during the third 294 miles, and during the last 279 miles. What was the length of the trip?

2. The ship carried a *crew* of 116 men. It also carried the following *passengers*: 293 men, 378 women, and 167 children. How many people were there on board?

3. They used 460 pounds of meat the first day, 385 pounds the second day, 489 pounds the third day, and 507 pounds the fourth day. How much meat was used during the trip?

4. The baker on board the ship baked 860 loaves of bread the first day, 649 loaves the second day, 736 loaves the third day, and 700 loaves the last day. How much bread was baked during the trip?

5. At each dinner the dishwashers washed 986 plates, 638 cups, 638 saucers, and 864 other dishes. What was the total number of dishes washed?

SIGHT EXERCISE

Add at sight:

$$\begin{array}{r} 1. \ 12 \\ \ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \ 14 \\ \ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \ 13 \\ \ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \ 15 \\ \ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \ 11 \\ \ 5 \\ \hline \end{array}$$

SIGHT EXERCISE

Addition Drill by Decades

Add at sight and memorize:

$$\begin{array}{r} 2 \quad 12 \quad 22 \quad 32 \quad 42 \quad 52 \quad 62 \quad 72 \quad 82 \quad 92 \\ \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1} \end{array}$$

$$\begin{array}{r} 2 \quad 12 \quad 22 \quad 32 \quad 42 \quad 52 \quad 62 \quad 72 \quad 82 \quad 92 \\ \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \quad \underline{2} \end{array}$$

$$\begin{array}{r} 2 \quad 12 \quad 22 \quad 32 \\ \underline{3} \quad \underline{3} \quad \underline{3} \quad \underline{3} \text{ etc.} \end{array}$$

$$\begin{array}{r} 2 \quad 12 \quad 22 \quad 32 \\ \underline{4} \quad \underline{4} \quad \underline{4} \quad \underline{4} \text{ etc.} \end{array}$$

$$\begin{array}{r} 2 \quad 12 \quad 22 \quad 32 \\ \underline{5} \quad \underline{5} \quad \underline{5} \quad \underline{5} \text{ etc.} \end{array}$$

ORAL PROBLEMS

1. Mother went to the fruit store. She spent 7 cents for apples, 9 cents for oranges, and 2 cents for a lemon. How much did she spend?

2. She then went to the butcher's. She bought 10 cents' worth of soup meat and a chicken for 50 cents. How much did she spend at the butcher's?

3. Then she went to the grocer's, where she bought a pound of coffee for 35 cents and 20 cents' worth of sugar. How much must she pay the grocer?

4. At the baker's she bought a loaf of bread for 8 cents and 6 rolls at one cent each. How much money did she give the baker?

5. Her last trip was to the butter and egg store, where she bought a pound of butter for 30 cents and 25 cents' worth of eggs. How much did she spend in this store?

WRITTEN EXERCISE

Add:

1. 2563	2. 3257	3. 4865	4. 6293	5. 5807
5416	8629	5764	8721	9368
<u>3454</u>	<u>4796</u>	<u>2086</u>	<u>7490</u>	<u>2921</u>

WRITTEN PROBLEMS

1. There are three small towns in one *county*. The number of people living in these towns is 3987 in the first, 4076 in the second, 2783 in the third. How many live in the entire county?

2. A doctor living in one of these towns bought a lot for \$1800. The house he built upon it cost \$3475 and his barn cost \$750. What was the entire cost?

3. At an *election* 786 votes were cast in one town, 800 in the second town, and 639 in the third town. How many votes were cast in the 3 towns?

4. Each town had its own *kindergarten*. The first town had 12 girls and 18 boys in its kindergarten, the second had 15 girls and 16 boys, and the third had 14 girls and the same number of boys. How many boys in all these kindergartens together? How many girls? How many children?

5. Each town had its own *library*. The first library *contained* 2000 books, the second, half as many as the first, and the third, 1800 books. Find the total number of books.

SIGHT EXERCISE

Addition Drill by Decades

Add at sight and memorize :

$$\begin{array}{r} 2 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ \hline \end{array} \quad \begin{array}{r} 6 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ \hline \end{array} \quad \begin{array}{r} 7 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ \hline \end{array} \quad \begin{array}{r} 8 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ \hline \end{array} \quad \begin{array}{r} 22 \\ \hline \end{array} \quad \begin{array}{r} 32 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ \hline \end{array} \quad \begin{array}{r} 9 \text{ etc.} \\ \hline \end{array}$$

SIGHT EXERCISE

Add at sight :

$$\begin{array}{r} 1. \ 16 \\ \hline \end{array} \quad \begin{array}{r} 2. \ 18 \\ \hline \end{array} \quad \begin{array}{r} 3. \ 17 \\ \hline \end{array} \quad \begin{array}{r} 4. \ 19 \\ \hline \end{array} \quad \begin{array}{r} 5. \ 15 \\ \hline \end{array}$$

ORAL PROBLEMS

1. Kate has 9 pictures in one *envelope*, 8 pictures in a second envelope, and 10 pictures in a third envelope. How many pictures has she in all ?

2. Kate and her friends, Rose and Adele, had a dolls' party. Kate brought 5 dolls, Rose and Adele each brought 6 dolls. How many dolls at the party?

3. Kate showed her friends all her dolls' dresses. One of her five dolls had 3 dresses, one had 2 dresses, and each of the others had only 1 dress. How many dresses did Kate show?

4. They had a little tea party for which they used 6 plates, 3 cups, 3 saucers, and 2 other dishes. How many dishes in all?

5. They played 8 games before tea and 5 games after tea. How many games did they play?

WRITTEN EXERCISE

Add:

1. 3726	2. 6849	3. 7058	4. 3908	5. 2880
6187	5064	8724	9226	4963
2076	4800	3009	2118	7744
<u>6000</u>	<u>7966</u>	<u>8495</u>	<u>7283</u>	<u>6496</u>

WRITTEN PROBLEMS

1. A grocer sold a pound of tea for 75 cents, a pound of coffee for 36 cents, a bag of meal for 58 cents, and a half pound of butter for 18 cents. What was the *amount* of his bill?

2. Mother bought a box of *cocoa* for 19 cents, a box of *baking powder* for 22 cents, 5 cents' worth of pepper, a bag of salt for 5 cents, and a bag of *oatmeal* for 28 cents. What was the amount of her bill?

3. On the day before *Thanksgiving* I bought a pound of figs for 23 cents, a pound of *currants* for 10 cents, a bag of nuts for 50 cents, a jar of jelly for 29 cents, and some *cranberries* for 19 cents. What did I spend for all?

4. For the same Thanksgiving dinner I ordered a dollar's worth of ice cream and a quarter's worth of cake. What did the ice cream and cake cost?

5. On the same day I ordered a twelve-pound turkey for \$2.80 and a pair of chickens that cost half as much as the turkey. What did both cost?

SIGHT EXERCISE

Addition Drill by Decades

Add at sight and memorize :

3	13	23	33	43	53	63	73	83	93
<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

3	13	23	33
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u> etc.

3	13	23	33
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u> etc.

$$\begin{array}{r} 3 \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 4 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ 5 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 5 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 5 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 5 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 6 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 7 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 8 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 9 \text{ etc.} \\ \hline \end{array}$$

SIGHT EXERCISE

Add at sight:

$$\begin{array}{r} 1. \ 16 \\ \quad 6 \\ \hline \end{array} \quad \begin{array}{r} 2. \ 19 \\ \quad 5 \\ \hline \end{array} \quad \begin{array}{r} 3. \ 18 \\ \quad 8 \\ \hline \end{array} \quad \begin{array}{r} 4. \ 17 \\ \quad 9 \\ \hline \end{array} \quad \begin{array}{r} 5. \ 15 \\ \quad 7 \\ \hline \end{array}$$

ORAL PROBLEMS

1. Peter walked 6 blocks before school, 8 blocks at the noon *recess*, and 10 blocks after school. How far did he walk?

2. He passed 4 cars in the morning, 7 cars at noon, 9 cars after school. How many cars did he pass during the three walks?

3. He met 8 boys in the morning, 7 at noon, and 10 after school. How many in all did he meet?

4. He stopped to speak to a newsboy to whom he said, "How many papers have you sold to-day?" The newsboy answered, "8 *Heralds*, 10 *Posts*, and 4 *Globes*." How many papers did the boy sell?

5. The morning walk took 10 minutes, the noon walk took 15 minutes, and the afternoon walk took 20 minutes. How much time had Peter spent in walking?

WRITTEN EXERCISE

Add:

1. 67	2. 86	3. 45	4. 93	5. 72
79	38	29	17	69
58	67	76	85	94
13	24	35	46	57
68	79	88	97	16
27	38	49	50	61
<u>46</u>	<u>53</u>	<u>72</u>	<u>83</u>	<u>94</u>

WRITTEN PROBLEMS

Fill in the blanks in the following examples, using any number between 20 and 100:

1. A newsboy sold — papers on Monday, — papers on Tuesday, — papers on Wednesday, and — papers on Thursday. In the four days he sold — papers.

2. John weighs — pounds; Fred weighs — pounds. Together they weigh — pounds.

3. The *principal* gave — pencils to one class, — pencils to another class, and — pencils to a third class. How many pencils did she give to the three classes together?

4. Our teacher *dictated* — words on Monday, — words on Wednesday, and — words on Friday. In those three days we wrote — words.

5. There are — houses on A Street, — houses on B Street, and — houses on C Street. How many houses on the three streets?

SIGHT EXERCISE

Addition Drill by Decades

Add at sight and memorize :

1. Add 1 to each number in the outer circle.

Add 2 to each number in the outer circle; add 3, 4, 5, 6, 7, 8, 9.

2. Draw a picture like the one in this exercise. Put the numbers 5, 15, 25, etc., in the outer circle.

Add 1 to each number in the outer circle; add 2 to each number; add 3, 4, 5, 6, 7, 8, 9.

NOTE TO TEACHER. — Place the pointer on a number in the inner circle, then place the pointer on successive numbers in the outer circle. The children should give the answers instantly.



SIGHT EXERCISE

Add at sight:

- | | | | | |
|----------|----------|----------|----------|----------|
| 1. 36 | 2. 28 | 3. 74 | 4. 52 | 5. 67 |
| <u>9</u> | <u>8</u> | <u>7</u> | <u>6</u> | <u>5</u> |

ORAL PROBLEMS

1. John is 12 years old ; Henry is 7 years older. How old is Henry ? What is the sum of their ages ?

2. Mary is 10 years old ; Jane is half as old as Mary. What is the sum of their ages ?

3. William is 18 years old, Rachel is 24 years old ; their mother is as old as both William and Rachel together. What is the sum of their ages ?

4. Henry has \$16.44 ; Louis has \$4.63 more than Henry. How much money have both together ?

5. George has \$20.89 ; Charles has \$16.42 ; Harry has as much as both George and Charles. How much has Harry ? How much have all three ?

WRITTEN EXERCISE

Add :

- | | | | | |
|--------------|-----------|-----------|-----------|-----------|
| 1. 279 | 2. 726 | 3. 26 | 4. 269 | 5. 366 |
| 38 | 2,840 | 418 | 493 | 1,582 |
| 4,026 | 63 | 5,320 | 692 | 400 |
| 910 | 500 | 962 | 46 | 69 |
| 84 | 8,963 | 800 | 822 | 3,090 |
| <u>6,000</u> | <u>25</u> | <u>46</u> | <u>10</u> | <u>28</u> |

SIGHT EXERCISE

Adding Tens or Multiples of Ten

Add at sight and memorize :

$$\begin{array}{r} 1. \quad 10 \quad 11 \quad 21 \quad 21 \quad 41 \quad 51 \quad 61 \quad 71 \quad 81 \quad 91 \\ \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \end{array}$$

$$\begin{array}{r} 2. \quad 10 \quad 11 \quad 21 \quad 31 \quad 41 \\ \quad \underline{20} \quad \underline{20} \quad \underline{20} \quad \underline{20} \quad \underline{20} \text{ etc.} \end{array}$$

$$\begin{array}{r} 3. \quad 10 \quad 11 \quad 21 \quad 31 \quad 41 \\ \quad \underline{30} \quad \underline{30} \quad \underline{30} \quad \underline{30} \quad \underline{30} \text{ etc.} \end{array}$$

4. Add 40 in the same way to 10, 11, etc.
5. Add 50 in the same way to 10, 11, etc.
6. Add 60 in the same way.
7. Add 70 in the same way.
8. Add 80 in the same way.
9. Add 90 in the same way.
10. Add 20 to 50, 36, 47, 59, 28, 65, 53, 34, 17.
11. Add 40 to the same numbers.
12. Add 70 to the same numbers.

1.	2.	3.	4.	5.	6.	7.	8.
* 57	49	38	26	19	74	85	68
<u>35</u>	<u>26</u>	<u>47</u>	<u>59</u>	<u>64</u>	<u>19</u>	<u>17</u>	<u>29</u>

*The best way to add these numbers is: $57 + 30 = 87$; and 5 make 92. Say 57, 87, 92.

1.	2.	3.	4.	5.	6.	7.	8.
21	32	24	17	14	22	62	25
32	53	41	20	35	15	50	72
<u>43</u>	<u>44</u>	<u>63</u>	<u>31</u>	<u>60</u>	<u>42</u>	<u>17</u>	<u>61</u>
9.	10.	11.	12.	13.	14.	15.	16.
32	52	65	47	19	84	29	88
49	19	20	56	75	62	50	75
<u>64</u>	<u>36</u>	<u>89</u>	<u>53</u>	<u>23</u>	<u>59</u>	<u>36</u>	<u>39</u>
17.	18.	19.	20.	21.	22.	23.	24.
52	64	78	43	91	87	73	29
40	58	63	77	86	92	19	81
33	61	17	20	37	46	58	64
84	<u>70</u>	<u>92</u>	<u>85</u>	47	69	45	38

EXERCISES IN ADDITION

12

Add:

26.	27.	28.	29.	30.	31.	32.
38	78	18	62	96	87	52
77	54	72	70	22	32	28
17	80	73	89	78	90	67
75	36	47	43	67	79	55
19	93	38	58	94	63	89
<u>38</u>	<u>78</u>	<u>18</u>	<u>62</u>	<u>96</u>	<u>87</u>	<u>52</u>

3.	34.	35.	36.	37.	38.	39.	40.
40	46	22	19	73	16	51	88
58	83	33	28	82	95	40	40
63	92	44	37	91	84	39	69
77	37	55	46	18	73	28	36
86	85	66	55	27	62	17	87
92	47	77	64	30	59	96	56
<u>40</u>	<u>46</u>	<u>22</u>	<u>19</u>	<u>73</u>	<u>16</u>	<u>51</u>	<u>88</u>

41.	42.	43.	44.	45.	46.	47.	48.
91	82	73	64	55	46	37	28
34	19	90	89	78	67	56	45
23	12	81	70	69	58	47	36
82	71	25	14	93	60	59	48
37	94	83	72	26	61	50	15
49	38	27	16	90	89	78	67
56	45	34	23	12	77	88	90
<u>91</u>	<u>82</u>	<u>73</u>	<u>64</u>	<u>55</u>	<u>46</u>	<u>37</u>	<u>28</u>

ADDITION

i:

50.	51.	52.	53.	54.	55.	56.	
0	55	44	33	22	11	72	58
17	36	25	14	70	69	58	48
38	98	88	78	68	58	47	37
27	17	97	87	77	67	57	46
36	26	16	96	86	76	66	56
49	90	89	70	69	90	49	80
70	38	45	28	37	64	72	88
16	19	60	63	70	27	90	39

Numbers of Three Orders

Add:

1.	2.	3.	4.	5.	6.
231	728	927	863	643	530
649	609	563	209	822	698
843	732	870	840	907	209
<u>298</u>	<u>643</u>	<u>249</u>	<u>936</u>	<u>884</u>	<u>693</u>

7.	8.	9.	10.	11.	12.
728	256	638	293	441	664
836	478	911	486	375	737
409	691	407	729	287	892
285	803	830	992	821	487
680	125	694	783	309	649
<u>436</u>	<u>347</u>	<u>837</u>	<u>607</u>	<u>720</u>	<u>900</u>

EXERCISES IN ADDITION

Add:

13.	14.	15.	16.	17.	18.
642	738	293	793	829	
893	209	392	975	706	
748	940	923	843	828	288
609	746	329	692	478	847
920	577	675	743	890	908
722	690	840	291	264	462
<u>148</u>	<u>812</u>	<u>408</u>	<u>643</u>	<u>849</u>	<u>948</u>

Numbers of Four Orders

Add:

1.	2.	3.	4.	5.
2,063	3,456	3,715	3,925	3,161
3,548	7,890	9,348	1,473	6,494
5,723	1,234	2,604	6,958	9,427
6,730	5,678	5,937	1,403	2,750
4,475	9,012	1,560	6,258	5,383
<u>3,605</u>	<u>3,456</u>	<u>4,826</u>	<u>4,706</u>	<u>8,605</u>

6.	7.	8.	9.	10.
\$ 23.59	\$ 2.41	\$ 20.15	\$ 10.89	\$ 63.42
60.84	27.93	19.70	43.23	29.71
3.98	31.80	6.48	6.66	36.47
2.27	42.56	3.23	91.12	84.48
61.87	9.81	79.00	24.54	92.36
<u>14.32</u>	<u>2.45</u>	<u>2.76</u>	<u>76.77</u>	<u>7.84</u>

SUBTRACTION

Introduction

||||| 1. Here are 5 splints. If you take 1
||| | away, how many have you left?

||| || 2. If you take 2 away from 5, how many
are left?

3. If 3 were taken away from 5, how many
would be left?

|||||| 4. Here are 7 splints. Take 1 away and
find how many are left.

We say 1 from 7 leaves 6

5. How many are 2 from 7? 3 from 7? 4 from 7?

6. Count backwards from 8 to 1.

8, 7, 6, 5, 4, 3, 2, 1.

7. How many are 2 less than 8? 3 less than 8?
4 less than 8?

Write the example 2 less than 8 in this way: $8 - 2$:
the sign $-$ is called *minus*. These examples are ex-
amples in subtraction; when we take 2 from 8, we
subtract 2 from 8. The answer is called the *difference*.
Read $8 - 2 = 6$.

8. Find the difference between each number in the circumference and the number in the center.



9. Change the number in the center to 4, and find the difference as before.

Proofs in Subtraction

ORAL EXERCISE



If you take 5 apples from 8 apples, how many are left?

Then $8 - 5 = 3$.

2. If we add 3 apples to 5 apples, how many apples in all? Then $5 + 3 = 8$.

1ST EXAMPLE

8 Minuend.
 $\underline{-5}$ Subtrahend.
 3 Remainder.

2D EXAMPLE

3 Subtrahend of 1st example.
 $\underline{+5}$ Remainder of 1st example.
 8 Minuend of 1st example.

You see that if you add the subtrahend and the remainder of an example in subtraction, you should get

the minuend. If you make a mistake in the 1st example, your answer in the 2d example will not be the same as the minuend. By adding the subtrahend and the remainder, you can find out if you subtracted correctly.

Addition is the Proof of Subtraction

$$\begin{array}{r} \text{From } 78 \\ \text{Take } 32 \\ \hline 46, \text{ or } 78 - 32 = 46. \end{array}$$

PROOF.—Now add 46 and 32, and tell the sum.

Whenever you wish to *prove* an example in subtraction, add the remainder and the subtrahend. If your work is correct, their sum will be the same number as the minuend.

Another way to prove an example in subtraction is by taking the remainder away from the minuend. The new remainder will be the same number as the former subtrahend.

Let us see if that is true.

$$\begin{array}{r} \text{From } 78 \\ \text{Take } 32 \\ \hline 46 \end{array}$$

PROOF

$$\begin{array}{r} \text{From } 78 \\ \text{Take } 46 \\ \hline 32 \end{array}$$

The new remainder 32 is the same number as the old subtrahend. This *proves* that the work is correct.

Subtract the following pairs of numbers and prove that each answer is correct by adding to it the remainder :

1. $\begin{array}{r} 45 \\ 23 \\ \hline \end{array}$

2. $\begin{array}{r} 37 \\ 16 \\ \hline \end{array}$

3. $\begin{array}{r} 54 \\ 36 \\ \hline \end{array}$

4. $\begin{array}{r} 67 \\ 29 \\ \hline \end{array}$

5. $\begin{array}{r} 72 \\ 39 \\ \hline \end{array}$

✓

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and memorize :

11	21	31	41	51	61	71	81	91
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

11	21	31	41	51	61	71	81	91
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>

11	21	31	41	51	61	71	81	91
<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>

11	21	31	41	51	61	71	81	91
<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>

ORAL PROBLEMS

1. There are 12 girls in the first *section*. 7 were perfect in spelling. How many had words wrong?
2. The second section contained 15 girls. 3 remained home. How many were present?
3. 9 of the girls in the first section read without making mistakes. How many made mistakes?
4. One fourth of the girls in the first section remained after school. How many went home?
5. 8 girls in the first section were *promoted*. How many were not promoted?

WRITTEN EXERCISE

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| 1. 79 | 2. 65 | 3. 84 | 4. 96 | 5. 77 |
| <u>23</u> | <u>31</u> | <u>40</u> | <u>63</u> | <u>25</u> |

Prove examples 2 and 5.

WRITTEN PROBLEMS

1. A man 85 years old to-day was married 44 years ago. How old was he when he married?
2. When he was 62 years old, his wife died. How long ago did she die?
3. His oldest son is 43 years old. How old was the father when his son was born?
4. How much older is the father than the son?

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and memorize:

11	21	31	41	51	61	71	81	91
<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>

11	21	31	41	51
<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u>	<u>7</u> etc.

11	21	31	41	51
<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u> etc.

11	21	31	41	51
<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u> etc. ...

SIGHT EXERCISE

Subtract at sight:

- | | | | | |
|----------|----------|----------|----------|----------|
| 1. 17 | 2. 28 | 3. 37 | 4. 45 | 5. 56 |
| <u>5</u> | <u>4</u> | <u>6</u> | <u>3</u> | <u>5</u> |

ORAL PROBLEMS

1. In a garden there are 27 roses; 6 of them are white, the others are red. How many red roses in the garden?
2. There were 18 vines of sweet peas; 7 have pink blossoms, the others have white blossoms. How many vines of white sweet peas?
3. A little boy picked 8 flowers in that garden. How many more must he pick to have 29 flowers for a bouquet?
4. His sister planted 20 morning-glory seeds in the garden; 6 vines grew from those seeds. How many seeds did not sprout?
5. One day she counted 9 flowers on her vines; the next day she counted 30. How many more flowers were there on the second day than on the first?

WRITTEN EXERCISE

- | | | | | |
|------------|------------|------------|------------|------------|
| 1. 536 | 2. 668 | 3. 782 | 4. 895 | 5. 986 |
| <u>321</u> | <u>453</u> | <u>271</u> | <u>582</u> | <u>462</u> |

Prove examples 1 and 4.

WRITTEN PROBLEMS

1. Our school contains 496 pupils; 231 are girls. How many boys in the school?
2. How many more boys than girls in the school?
3. 110 of the girls are in the *grammar department*, the others are in the *primary department*. How many girls are there in the primary department?
4. There are 445 scholars present to-day. How many are absent?
5. Of the 496 pupils, 32 are new scholars. How many are not new scholars?

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and memorize:

12	22	32	42	52	62	72	82	92
<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>

12	22	32	42
<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u> etc.

12	22	32	42
<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u> etc.

12	22	32	42
<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u> etc.

SIGHT EXERCISE

Subtract at sight :

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| 1. 28 | 2. 36 | 3. 48 | 4. 59 | 5. 74 |
| <u>13</u> | <u>22</u> | <u>26</u> | <u>35</u> | <u>42</u> |

ORAL PROBLEMS

1. A newsboy buys 56 papers and sells 43.
How many remain *unsold* ?

2. On another day he buys 24 papers, but sells
37. A friend *loaned* him the papers he needed.
How many papers did he borrow from his friend ?

3. On Saturday he sold 98 papers ; 37 he delivered at homes, the others he sold on the street.
How many did he sell on the street ?

4. He *expected* to earn 75 cents on Monday, but he earned only 54 cents. How much less did he earn than he expected to earn ?

5. After he had earned 54 cents, he gave his mother half a dollar. How much money remained ?

WRITTEN EXERCISE

Find the difference :

- | | | | | |
|-------------|-------------|-------------|-------------|-------------|
| 1. 7429 | 2. 3678 | 3. 4285 | 4. 5768 | 5. 3859 |
| <u>2115</u> | <u>2435</u> | <u>2161</u> | <u>3446</u> | <u>1525</u> |

Prove examples 3 and 5.

Subtraction where a Digit in the Subtrahend is Greater than the Corresponding Digit in the Minuend

GROUP 1. *Where the digit in units' place in the minuend is zero.*

1. From 60 take 34.

60 = 6 tens and 0 units.

34 = 3 tens and 4 units.

It is impossible to take 4 units from 0 units. In order to get a greater number of units, we may take 1 ten from the 6 tens. Change it to 10 units.

Our example is now in this form:

From 5 tens and 10 units

take 3 tens and 4 units. The remainder
is 2 tens and 6 units, or 26.

NOTE TO TEACHER. — Illustrate with splints.

SIGHT EXERCISE

Subtract at sight:

1.
$$\begin{array}{r} 30 \\ - 7 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 50 \\ - 5 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 70 \\ - 9 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 40 \\ - 8 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 60 \\ - 6 \\ \hline \end{array}$$

ORAL PROBLEMS

1. Mary had a dime and spent 4 cents. How much money has she left?

2. Harry had 3 dimes. He spent 9 cents. How much money remained?

3. John had 20 ct. He gave away 3 ct. How much money has he now?

4. Albert had 40 ct. in his bank. He drew out 7 ct. How much remained in his bank?

5. Margaret saved 60 ct. She spent 5 ct. for a blank book. How much money had she left?

WRITTEN EXERCISE

Find the difference:

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| 1. 60 | 2. 70 | 3. 80 | 4. 90 | 5. 50 |
| <u>23</u> | <u>41</u> | <u>68</u> | <u>57</u> | <u>35</u> |

Prove 1 and 2.

WRITTEN PROBLEMS

1. A grocer sold a pound of butter for 27 ct. His customer gave him a quarter of a dollar and a nickel. What change should the grocer give?

2. He sold $3\frac{1}{2}$ pounds (lb.) of sugar for 26 ct. He received 3 dimes in payment. What was the amount of the change?

3. In the same store I bought several articles, which amount to 37 cents. How much change is due me if I give a 50-cent piece in payment?

4. At another time I bought a peck of potatoes for 45 cents. How much change did I get from a \$1 bill?

5. The same grocer bought 100 lb. of rice; he sold all but 11 lb. How many pounds did he sell?

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and memorize :

$\begin{array}{r} 13 \\ 4 \\ \hline 9 \end{array}$	$\begin{array}{r} 23 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 63 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 73 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 83 \\ 4 \\ \hline \end{array}$	$\begin{array}{r} 93 \\ 4 \\ \hline \end{array}$
--	--	--	--	--	--	--	--	--

$\begin{array}{r} 13 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 5 \\ \hline \end{array}$ etc.
--	--	--	--	---

$\begin{array}{r} 13 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 6 \\ \hline \end{array}$ etc.
--	--	--	--	---

$\begin{array}{r} 13 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 7 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 7 \\ \hline \end{array}$ etc.
--	--	--	--	---

$\begin{array}{r} 13 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 8 \\ \hline \end{array}$ etc.
--	--	--	--	---

$\begin{array}{r} 13 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 23 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 33 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ 9 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 9 \\ \hline \end{array}$ etc.
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WRITTEN EXERCISE

1. $\begin{array}{r} 90 \\ 72 \\ \hline \end{array}$	2. $\begin{array}{r} 80 \\ 43 \\ \hline \end{array}$	3. $\begin{array}{r} 70 \\ 54 \\ \hline \end{array}$	4. $\begin{array}{r} 60 \\ 15 \\ \hline \end{array}$	5. $\begin{array}{r} 50 \\ 36 \\ \hline \end{array}$	6. $\begin{array}{r} 40 \\ 27 \\ \hline \end{array}$
--	--	--	--	--	--

7. $\begin{array}{r} 20 \\ 17 \\ \hline \end{array}$	8. $\begin{array}{r} 40 \\ 23 \\ \hline \end{array}$	9. $\begin{array}{r} 60 \\ 41 \\ \hline \end{array}$	10. $\begin{array}{r} 80 \\ 65 \\ \hline \end{array}$	11. $\begin{array}{r} 50 \\ 29 \\ \hline \end{array}$	12. $\begin{array}{r} 70 \\ 54 \\ \hline \end{array}$
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13. 390	14. 470	15. 530	16. 650	17. 870	18. 760
<u>156</u>	<u>325</u>	<u>217</u>	<u>427</u>	<u>612</u>	<u>325</u>

GROUP 2. *Where the digit in units' place in the minuend is greater than zero.*

1. There were 42 girls in a class; 29 were promoted. How many girls were not promoted?

1ST METHOD

$$42 = 30 + 10 + 2$$

$$29 = \underline{20} + 9$$

$$10 + 1 + 2 = 13, \text{ Ans.}$$

Note that 1 ten is changed to 10 units; 9 units are subtracted from 10 units, leaving 1 unit; there remains 1 unit + 2 units or 3 units; 2 tens from 3 tens leaves 1 ten. (9 from 10 leaves 1; 1 and 2 are 3; put down 3; 2 tens from 3 tens leaves 1 ten; put down 1.)

2D METHOD

$$42 = 30 + 10 + 2 = 30 + 12$$

$$29 = \underline{20 + 9}$$

$$10 + 3 = 13$$

Note that 1 ten is changed to 10 units, and that the 10 units are added to 2 units. 9 units are subtracted from 12 units. ($10 + 2 = 12$; 9 from 12 leaves 3; put down 3. 2 tens from 3 tens leaves 1 ten; put down 1.)

3D METHOD

The Austrian Method:

$$42 \quad 9 + 3 = 12; \text{ put down } 3,$$

$$\underline{29} \quad 2 + 1 = 3; \text{ put down } 1,$$

$$13 \quad \text{or } 9 + 3 = 12; 3 + 1 = 4. \text{ Ans. } 13.$$

This method uses addition to obtain the remainder. It is the method used in making change in stores; *e.g.* if a customer purchases 60 ct. worth of goods, and gives a dollar bill in payment, the clerk will say, $60 + 40 = \$1$, and give the customer 40 ct. change.

Decide on the method you prefer, and then *always use that method*. It is very confusing to try to work at different times by different methods.

SIGHT EXERCISE

Subtract at sight:

1. $\begin{array}{r} 24 \\ 7 \\ \hline \end{array}$	2. $\begin{array}{r} 32 \\ 8 \\ \hline \end{array}$	3. $\begin{array}{r} 45 \\ 6 \\ \hline \end{array}$	4. $\begin{array}{r} 23 \\ 5 \\ \hline \end{array}$	5. $\begin{array}{r} 34 \\ 9 \\ \hline \end{array}$
---	---	---	---	---

ORAL PROBLEMS

1. A class with 42 on *register* has 5 absentees. How many are present?
2. Of those present, 4 *failed* in spelling. How many were perfect?
3. Of the whole class, 9 are new scholars. How many were in the class at the beginning of the term?
4. How many more pupils must be put into the class to make 48?
5. After there were 48 in the class, 9 were *transferred*. What was the new register of the class?

Prove examples 4 and 5.

WRITTEN EXERCISE

1. $\begin{array}{r} 72 \\ 28 \\ \hline \end{array}$	2. $\begin{array}{r} 51 \\ 19 \\ \hline \end{array}$	3. $\begin{array}{r} 83 \\ 37 \\ \hline \end{array}$	4. $\begin{array}{r} 55 \\ 26 \\ \hline \end{array}$	5. $\begin{array}{r} 46 \\ 28 \\ \hline \end{array}$	6. $\begin{array}{r} 94 \\ 49 \\ \hline \end{array}$
--	--	--	--	--	--

7. $\begin{array}{r} 85 \\ 26 \\ \hline \end{array}$	8. $\begin{array}{r} 97 \\ 69 \\ \hline \end{array}$	9. $\begin{array}{r} 61 \\ 18 \\ \hline \end{array}$	10. $\begin{array}{r} 34 \\ 27 \\ \hline \end{array}$	11. $\begin{array}{r} 52 \\ 25 \\ \hline \end{array}$	12. $\begin{array}{r} 73 \\ 48 \\ \hline \end{array}$
--	--	--	---	---	---

13. $\begin{array}{r} 287 \\ 158 \\ \hline \end{array}$	14. $\begin{array}{r} 345 \\ 226 \\ \hline \end{array}$	15. $\begin{array}{r} 462 \\ 119 \\ \hline \end{array}$	16. $\begin{array}{r} 571 \\ 238 \\ \hline \end{array}$	17. $\begin{array}{r} 684 \\ 356 \\ \hline \end{array}$	18. $\begin{array}{r} 792 \\ 545 \\ \hline \end{array}$
---	---	---	---	---	---

19. $\begin{array}{r} 328 \\ 156 \\ \hline \end{array}$	20. $\begin{array}{r} 549 \\ 284 \\ \hline \end{array}$	21. $\begin{array}{r} 728 \\ 583 \\ \hline \end{array}$	22. $\begin{array}{r} 625 \\ 345 \\ \hline \end{array}$	23. $\begin{array}{r} 839 \\ 481 \\ \hline \end{array}$	24. $\begin{array}{r} 471 \\ 144 \\ \hline \end{array}$
---	---	---	---	---	---

WRITTEN PROBLEMS

1. The distance from New York to San Francisco is about 3249 miles. After the train has gone 2027 miles, how many miles remain to be traveled?

2. From New York to Albany is 143 miles. How many miles has a New York man *traveled* if he stops at a town 28 miles south of Albany?

3. From 23d Street to 62d Street is how many blocks?

Fill in the following —, with numbers of 3 or 4 orders:

4. From London to New York is — mi. At the end of 3 days a steamer coming to New York from London has sailed — mi. The steamer still has — mi. to go.

5. From Boston to Denver is — mi. A train which started from Boston stops — mi. before it reaches Denver. The train has gone over — mi.

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and memorize:

$$\begin{array}{r} 12 \\ 7 \end{array} \quad \begin{array}{r} 22 \\ 7 \end{array} \quad \begin{array}{r} 32 \\ 7 \end{array} \quad \begin{array}{r} 42 \\ 7 \end{array} \text{ etc.}$$

$$\begin{array}{r} 12 \\ 8 \end{array} \quad \begin{array}{r} 22 \\ 8 \end{array} \quad \begin{array}{r} 32 \\ 8 \end{array} \quad \begin{array}{r} 42 \\ 8 \end{array} \text{ etc.}$$

$$\begin{array}{r} 12 \\ 9 \end{array} \quad \begin{array}{r} 22 \\ 9 \end{array} \quad \begin{array}{r} 32 \\ 9 \end{array} \quad \begin{array}{r} 42 \\ 9 \end{array} \text{ etc.}$$

WRITTEN EXERCISE

$$\begin{array}{lllll} 1. & 75 & 2. & 63 & 3. & 81 & 4. & 92 & 5. & 73 \\ & \underline{48} & & \underline{37} & & \underline{56} & & \underline{29} & & \underline{55} \end{array}$$

If he sells for more than the cost, he gains. If he sells for less than the cost, he loses.

WRITTEN PROBLEMS

1. Bought for \$ 65; sold for \$82. Gain?
2. Bought for \$ 65; sold for \$57. Loss?
3. Sold for \$93; bought for \$78. Gain or loss, and how much?
4. Bought for 73 ct.; sold for 69 ct. Gain or loss, and how much?
5. Sold for \$83; bought for \$75. Gain or loss, and how much?

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and 'memorize :

[illegible]

14 24 34 44 54
6 6 6 6 6 etc.

14 24 34 44 54
7 7 7 7 7 etc.

$$\begin{array}{r} 14 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 24 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 34 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 54 \\ 8 \text{ etc.} \\ \hline \end{array}$$

$$\begin{array}{r} 14 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 24 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 34 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 54 \\ 9 \text{ etc.} \\ \hline \end{array}$$

ORAL PROBLEMS

Thirty days has September,
 April, June, and November.
 All the rest have thirty-one
 Save February alone,
 Which has four and twenty-four
 And every leap year one day more.

1. How many days in April after the 7th?
2. How many days in July after the 17th?
3. How many days in December after the 19th?

WRITTEN EXERCISE

- | | | | | |
|------------|------------|------------|------------|------------|
| 1. 360 | 2. 240 | 3. 420 | 4. 560 | 5. 780 |
| <u>125</u> | <u>118</u> | <u>209</u> | <u>321</u> | <u>425</u> |

WRITTEN PROBLEMS

1. There are 365 days in the year. School was closed on 178 days. How many school days in the year?
2. In a certain year there were 279 sunny days; the rest were cloudy. How many days were cloudy?

3. Our teacher was out of town for 96 days during the year. How many days was she in town?

4. Charlie saved a cent every day in the year except Sundays. There were 52 Sundays in the year. How much money did he save?

5. How many days in the year, leaving out December?

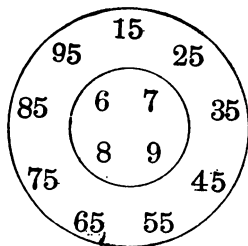
SIGHT EXERCISE

Subtraction Drill by Decades

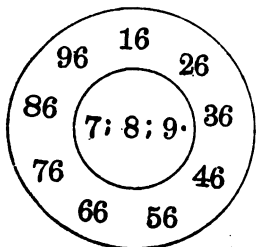
Subtract at sight and memorize:

1. Subtract 6 from each number in the outer circle.

2. Subtract 7 from each number; subtract 8; subtract 9.



NOTE TO TEACHER. — Place the pointer on a number in the inner circle, then place the pointer on successive numbers in the outer circle. The children should give the answers instantly.



3. Subtract 7 from each number in the outer circle.

4. Subtract 8 from each number; subtract 9.

SIGHT EXERCISE

Subtract at sight:

- | | | | | |
|--|--|--|--|--|
| 1. $\begin{array}{r} 43 \\ 17 \end{array}$ | 2. $\begin{array}{r} 65 \\ 27 \end{array}$ | 3. $\begin{array}{r} 36 \\ 19 \end{array}$ | 4. $\begin{array}{r} 45 \\ 29 \end{array}$ | 5. $\begin{array}{r} 54 \\ 36 \end{array}$ |
|--|--|--|--|--|

ORAL PROBLEMS

1. I must read 48 pages. On Monday I read 19 pages. How many pages have I still to read?
2. On Tuesday I read all but the last 9 pages. How many pages did I read on Tuesday?
3. A page contained 32 lines. I copied all but 13 lines. How many lines did I copy?
4. Our teacher dictated 40 words from the page. 17 of these words were new words to us. How many *review* words did we write?
5. There were 43 pupils present in our class. 14 were perfect in dictation. How many pupils made mistakes?

WRITTEN EXERCISE

- | | | | | |
|-------------|-------------|-------------|-------------|-------------|
| 1. \$ 6.48 | 2. \$ 4.51 | 3. \$ 5.82 | 4. \$ 6.39 | 5. \$ 4.83 |
| <u>2.09</u> | <u>1.37</u> | <u>3.55</u> | <u>4.81</u> | <u>2.69</u> |

Prove examples 3 and 4.

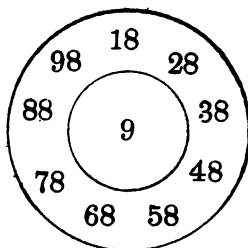
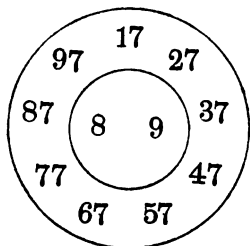
WRITTEN PROBLEMS

1. I had \$7.28; I spent \$6.09. How much did I have left?
2. I had \$9.19 before I went shopping; I had \$6.48 after I came home. How much did I spend?
3. I bought a watch for \$7.50; I sold it for \$6.80. Did I gain or lose, and how much?

SIGHT EXERCISE

Subtraction Drill by Decades

Subtract at sight and memorize :



- | | |
|--|--|
| <p>1. Subtract 8 from each number in the outer circle.</p> | <p>2. Subtract 9 from each number in the outer circle.</p> |
|--|--|

SIGHT EXERCISE

Subtract at sight :

- | | | | | |
|----------|----------|----------|----------|----------|
| 1. 439 | 2. 287 | 3. 506 | 4. 399 | 5. 256 |
| <u>7</u> | <u>3</u> | <u>5</u> | <u>7</u> | <u>4</u> |

ORAL PROBLEMS

1. A dairyman gathered 239 quarts (qt.) of milk ; he sold all but 7 quarts. How many quarts did he sell ?

2. He made 96 pounds (lb.) of butter. He kept 11 lb. for his own use and sent the *balance* to market. How many pounds did he send to market ?

3. He made 76 lb. of cheese ; 5 lb. turned sour. He sold the remainder. How much did he sell ?

4. He had 88 bottles of cream; the *contents* of 6 bottles *leaked* out. He sold the rest. How many bottles did he sell?

5. He sent the whole supply to market and received 84 dollars for it. It cost him 9 dollars to get the goods to market. How much did he make by the *transaction*?

WRITTEN EXERCISE

Subtract:

- | | | | | |
|-------------|-------------|-------------|-------------|-------------|
| 1. 5460 | 2. 6300 | 3. 8060 | 4. 7008 | 5. 9000 |
| <u>2645</u> | <u>4163</u> | <u>5328</u> | <u>4671</u> | <u>3504</u> |

Prove examples 1 and 5.

WRITTEN PROBLEMS

1. A storekeeper took in \$68.19; he paid out \$30.75. How much did he then have?

2. A club had \$21.40 in the *treasury*. An *entertainment* cost \$13.92. How much was then left in the treasury?

3. A boy earned \$26.50. He put \$8.75 into the bank and spent the rest. How much did he spend?

4. Some one offered me \$25.50 for a table which cost \$27.98. If I sell, shall I gain or lose, and how much?

5. From \$50 take \$16.82.

SIGHT EXERCISE

Subtract at sight:

- | | | | | |
|----------|----------|----------|----------|----------|
| 1. 320 | 2. 460 | 3. 530 | 4. 480 | 5. 350 |
| <u>8</u> | <u>7</u> | <u>9</u> | <u>6</u> | <u>7</u> |

ORAL PROBLEMS

1. A boy who had 90 ct. bought a book. Then he had 8 ct. left. What was the cost of the book?
2. The book contained 240 pages. 9 of the pages were blank. How many were not blank?
3. There were 360 words on one page. The boy could spell all but 6. How many words could he spell?
4. He wrote down 200 of the words and had 7 spelled wrong. How many did he write *correctly*?
5. From 600 take 9.

WRITTEN EXERCISE

Subtract:

- | | | | | |
|--------------|--------------|--------------|--------------|--------------|
| 1. \$71.12 | 2. \$62.81 | 3. \$50.35 | 4. \$38.25 | 5. \$46.75 |
| <u>26.53</u> | <u>28.26</u> | <u>37.08</u> | <u>15.60</u> | <u>28.25</u> |

Prove examples 3 and 4.

SIGHT EXERCISE

Subtract at sight:

- | | | | | |
|------------|------------|------------|------------|------------|
| 1. 428 | 2. 534 | 3. 289 | 4. 324 | 5. 565 |
| <u>317</u> | <u>213</u> | <u>147</u> | <u>112</u> | <u>154</u> |

ORAL PROBLEMS

1. $42 + ? = 63$.
2. $75 + ? = 88$.
3. $64 + 11 = ?$
4. $74 - 12 = ?$
5. $58 - 20 = ?$

WRITTEN EXERCISES

Subtract :

1.	2.	3.	4.	5.
27,640	48,387	320,982	50,017	680,200
<u>8,873</u>	<u>21,899</u>	<u>64,809</u>	<u>39,999</u>	<u>499,648</u>

Prove examples 4 and 5.

Problems in Addition and Subtraction

ORAL PROBLEMS

1. A boy has a *stack* of 60 newspapers. He sells 10 before breakfast and 20 between breakfast and school time. How many remain unsold?
2. On another day he had 40 papers, from which he sold 20 in the morning and 16 in the evening. How many papers had he left?
3. He made 11 ct. on Monday and 15 ct. on Tuesday. How much more must he make in order to have 50 ct.?
4. He purchased 100 papers. He sold 30 during the morning, 50 during the afternoon, and 15 during the evening. How many had he still to sell?

WRITTEN PROBLEMS

1. A man bought a horse for \$62.50, a set of *harness* for \$23.75, and a wagon for \$125. He sold the entire outfit for \$230.70. Did he gain or lose by the transaction, and how much?

2. Three children wish to save \$10 to buy a birthday present for their mother. The first saves \$2.98, the second \$3.14, the third 3 dollars and a half. Tell how much more money was needed to buy the present.

3. From \$86.48 take the sum of \$16.22, \$11.09, \$17.93.

4. A man bought a \$500 piano on six monthly *installments*. During January he paid \$100; February, \$87.50; March, \$95; April, \$56; May, \$87.50. How much must he pay during the month of June?

5. A man earns \$25 a week. He spends \$8 for board, 2 dollars and a half for *insurance*, 75 ct. for his washing, and \$3.26 for car fares, newspapers, and other *expenses*. What amount does he save?

6. The total *receipts* of a store for one month were \$650. The *proprietor* paid \$50 for rent, \$45 for help, \$350 for new goods, and \$37.50 for other expenses. How much greater were his receipts than his payments?

WRITTEN PROBLEMS

1. A school had 490 on register on the first of the month. During the month 138 new pupils were *admitted* and 43 were *discharged*. What was the register on the last day of the month?

2. In that school there were 2,076 books. 198 were sold as old paper because they were worn out, and 240 new ones were brought in. How many books did the school then have?

3. The principal had 600 pencils. To 7 classes she gave the following numbers *respectively*: 46, 42, 48, 45, 50, 47, 46. How many pencils did she still have on hand?

4. There were 12 classes in the school, with a total register of 490. In 5 classes every child was present. In the other classes the numbers of absentees were 2, 1, 3, 2, 3, 1, 2. How many pupils were present in the whole school?

5. The principal sent 5 classes to the *assembly* hall. These classes had 42, 45, 48, 47, 44 pupils. There were 300 seats in the assembly hall. How many seats were *vacant* after the pupils in the 5 classes were seated?

6. A school had a total register of 325 pupils. 24 pupils were promoted to the high school, 27 pupils were promoted to the 8th grade, 30 to the 7th grade, 33 to the 6th grade, 36 to the 5th grade, and 39 to the 4th grade. How many pupils were not promoted?

ORAL PROBLEMS

1. A farmer had 30 sheep. He sold 3, then 4, then 3, and then 6. How many sheep had he left?

2. He agreed to deliver 100 eggs to the *market*. On Monday he *gathered* 20, on Tuesday 30, and on Wednesday 30. How many more eggs did he need to gather?

3. He had 70 chickens. He bought 20 more; then he sold 52. How many chickens had he left?

4. His cows gave 27 qt. of milk in the morning and 18 qt. in the evening. He sold all but 6 qt. How many quarts did he sell?

5. He had 30 *acres* (A.) of ground. He sowed wheat in a 5-A. plot; rye, in 3 A.; oats, in 4 A.; barley, in 6 A. The rest he left for *pasture land*. How many acres of pasture land did he have?

WRITTEN PROBLEMS

1. A farmer raises 1,350 bu. of wheat, 875 bu. of rye, 2,200 bu. of corn, and 265 bu. of oats. His barn holds only 3,600 bu. How many bushels remain after the barn has been filled?

Fill in the blanks:

2. A milkman had 400 qt. of milk. He delivered — qt. before eight o'clock, — qt. between eight and nine o'clock, and — qt. after nine o'clock. How many quarts remained unsold?

3. He collected \$9.40 on Monday, — on Tuesday, — on Wednesday, — on Thursday, — on Friday, and enough on Saturday to make up \$90. How much did he collect on Saturday?

4. He sold 40 bottles of cream on Monday, half as many on Tuesday; on Wednesday he sold 6 bottles less than on Monday. How many bottles did he sell in the 3 days?

5. A milkman *collected* \$42.64 from one customer, \$29.68 from a second, \$76.45 from a third, and \$20.96 from a fourth. He spent \$88.88. How much money did he keep?

ORAL PROBLEMS

1. A man is 40 yr. old. His wife is 5 yr. younger than he. What is the sum of their ages?

2. A man is 40 yr. old. His baby is 5 yr. old. His oldest child is 10 yr. older than the baby. How old was the father when the oldest child was born?

3. A boy was born when his father was 32 yr. old. The father died 3 yr. before the boy's twenty-first birthday. How old was the father when he died?

4. A man died leaving two children aged 7 and 15 years, respectively. How old was the older child when the younger one was 18 years of age?

5. Morton is 6 yr. old. His sister Charlotte is 3 yr. older. His brother Stephen is as old as Morton and Charlotte together. How old is Stephen?

WRITTEN PROBLEMS

1. 426, 369, and another number make 1,201. What is the other number?
2. A boy earns 43 ct. on Monday and 27 ct. on Tuesday. He spends 16 ct. on Wednesday, but earns 24 ct. on Thursday. On Friday he loses a quarter of a dollar. How much has he on Friday night?
3. What number added to 5,207 equals 11,026?
4. To the sum of 56 and 95, add their difference.
5. From the sum of 219 and 164, take their difference.

ORAL PROBLEMS

1. I bought 25 ct. worth of eggs and a pound of coffee for 30 ct. How much change should I receive from a dollar?
2. How much change should I receive from half a dollar, if I spend 16 ct., 20 ct., and 4 ct.?
3. At the drug store I bought 10 ct. worth of *camphor*, a *toothbrush* for 25 ct., and a box of *talcum* for 15 ct. How much change should I receive from a 2 dollar bill?
4. A girl goes to the store with 4 dimes. She buys a lemon for 3 ct., some sugar for 17 ct., and a loaf of bread for 8 ct. How much money has she left?

WRITTEN EXERCISE

1. I bought goods in March for \$125.86,
in April for 62.80,
in May for 290.00,
in June for 75.85.

In July I paid \$475 *on account*. How much is still due?

2. A man whose *income* was 1,000 dollars paid :
\$ 162.80 for clothes,
390.00 for board,
2.80 for *medicine*,
20.00 to the doctor,
35.00 for *charity*,
60.48 for small expenses.

He *deposits the rest in a bank*. How much does he deposit?

3. A *committee* raised \$ 800 for a summer camp. These were the expenses: *furnishing and repairs*, \$ 173.84; *service*, \$ 240.15; office, \$ 28.65; food, \$ 206.17; *medical supplies*, \$ 13.79; other expenses, \$ 28.55. How much money was left?

4. A house cost \$ 2,400; the owner spent \$ 244.92 in repairs and alterations; he built a barn on the *premises* which cost \$ 975. He wishes to sell the property at a gain of \$ 250. What will be the selling price?

5. In a branch post office, one day's receipts were: for postal cards, \$19.62; for 1-ct. stamps, \$163.84; for 2-ct. stamps, \$429.76; for 5-ct. stamps, \$15.65; and for special delivery stamps, \$3.20. The postmaster turns in \$600, leaving the balance for the next day. How much goes over to the next day's account?

Numbers of Three or Four Orders

Subtract:

1.	2.	3.	4.	5.	6.
723	561	625	437	812	934
<u>246</u>	<u>374</u>	<u>186</u>	<u>259</u>	<u>528</u>	<u>385</u>

7.	8.	9.	10.	11.	12.
561	433	615	724	532	816
<u>473</u>	<u>237</u>	<u>519</u>	<u>645</u>	<u>238</u>	<u>568</u>

13.	14.	15.	16.	17.	18.
2,341	4,132	5,244	6,412	4,325	7,281
<u>1,728</u>	<u>2,516</u>	<u>2,736</u>	<u>2,831</u>	<u>1,482</u>	<u>5,591</u>

19.	20.	21.	22.	23.	24.
5,682	8,497	4,628	3,183	7,523	6,348
<u>3,296</u>	<u>4,828</u>	<u>2,279</u>	<u>1,948</u>	<u>4,861</u>	<u>2,783</u>

Numbers of Three Orders containing Ciphers

Subtract :

1.	2.	3.	4.	5.	6.
720	640	830	960	580	450
<u>189</u>	<u>274</u>	<u>362</u>	<u>846</u>	<u>438</u>	<u>293</u>

7.	8.	9.	10.	11.	12.
704	807	603	508	402	903
<u>286</u>	<u>368</u>	<u>235</u>	<u>179</u>	<u>157</u>	<u>268</u>

13.	14.	15.	16.	17.	18.
700	600	900	400	500	800
<u>238</u>	<u>146</u>	<u>523</u>	<u>248</u>	<u>319</u>	<u>466</u>

19.	20.	21.	22.	23.	24.
200	300	400	500	600	700
<u>108</u>	<u>107</u>	<u>205</u>	<u>309</u>	<u>406</u>	<u>508</u>

Numbers of Four Orders containing Ciphers.

Subtract :

1.	2.	3.	4.	5.	6.
2,340	4,760	5,280	1,760	5,760	1,440
<u>1,728</u>	<u>2,816</u>	<u>3,532</u>	<u>1,272</u>	<u>4,386</u>	<u>1,272</u>

7.	8.	9.	10.	11.	12.
7,740	8,690	9,270	4,660	5,380	8,660
<u>2,596</u>	<u>2,835</u>	<u>7,429</u>	<u>2,818</u>	<u>3,728</u>	<u>3,987</u>

DRILLS IN SUBTRACTION

53

13.	14.	15.	16.	17.	18.
4,700	6,400	8,500	9,600	3,800	7,300
<u>863</u>	<u>392</u>	<u>446</u>	<u>2,464</u>	<u>1,729</u>	<u>5,186</u>

19.	20.	21.	22.	23.	24.
4,060	3,080	5,030	9,006	7,005	8,003
<u>2,726</u>	<u>1,635</u>	<u>3,218</u>	<u>4,672</u>	<u>2,922</u>	<u>6,761</u>

25.	26.	27.	28.	29.	30.
4,600	3,500	5,800	6,400	7,900	8,800
<u>2,071</u>	<u>1,089</u>	<u>4,062</u>	<u>3,008</u>	<u>5,004</u>	<u>3,004</u>

Dollars and Cents

Subtract :

1.	2.	3.	4.
\$ 95.62	\$ 78.99	\$ 49.74	\$ 85.48
<u>31.40</u>	<u>7.68</u>	<u>20.32</u>	<u>81.20</u>

5.	6.	7.	8.
\$ 75.00	\$ 69.00	\$ 96.00	\$ 49.00
<u>47.62</u>	<u>2.83</u>	<u>80.80</u>	<u>10.68</u>

9.	10.	11.	12.
\$ 87.09	\$ 78.90	\$ 67.89	\$ 60.08
<u>62.93</u>	<u>23.45</u>	<u>54.97</u>	<u>21.09</u>

MULTIPLICATION

Introduction



1. How many boys are in each row of soldiers?
How many rows are there? How many soldier
boys are there?

How many are 4 times 2 boys?

(Say "4 times 2 boys are 8 boys.")

How many boys in 3 rows, if there are 2 boys in
each row?

How many boys in 5 rows, if there are 2 boys
in each row?

How many are 3 times 2 boys?

How many are 5 times 2 boys?

Count 2 three times. How much is 3 times 2?

Count 2 four times. How much is 4 times 2?

Count 2 five times. How much is 5 times 2?

Count 2 six times. How much is 6 times 2?



2. How many girls are in each row in the picture?
How many girls in 2 rows? How many girls
in 3 rows?

How many are 2 times 3 girls?

How many are 3 times 3 girls?

Count 3 four times. How much is 4 times 3?

Count 3 five times. How much is 5 times 3?

Count 3 six times. How much is 6 times 3?

3. John builds 4 piles of blocks. He puts 4 blocks
in each pile. How many blocks are there?

4 times 4 blocks = ?

4. Now, John builds 5 piles of blocks with 4
blocks in each pile. How many blocks does he use?

5 times 4 blocks = ?

5. $\overline{\quad\quad\quad}$
3 in. | 3 in. | 3 in. | 3 in.



How long is this line if each part represents
3 inches? 4 times 3 inches = ?

Cross References: Introduction to Division, page 103.

Introduction to Fractions, page 159.

Multiplication Table of Twos

NOTE TO TEACHER. — In this book, the multiplication tables are developed in regular order from 1 through 12. Many teachers teach the tables in a different order, *e.g.* 1, 10, 5, 2, 4, 8, 3, 6, 9, 12, 7, 11. The work is so arranged in this book that the teacher may follow any order of development.

1. Count 8 two times. How much is 2 times 8?
Count 9 two times. How much is 2 times 9?
Count 12 two times. How much is 2 times 12?
2. Add 3 splints + 3 splints.
How many 3's are there?
Then, how many are two 3's?
(Say "two threes are six.")
3. Add 2 splints plus 2 splints.  How many are 2 twos?
4. Add 4 splints and 4 splints.  How many are 2 fours?
5. How many are 2 fives?
6. Add 6 two times (6 plus 6). How many are 2 times 6?
7. Add 7 two times. How many are 2 times 7?
When we add 5 two times, we write $5 + 5$; but when we multiply 5 by 2, we write 2×5 .

The sign \times is the sign of multiplication. 2×5 cents is read: 2 times 5 cents.

NOTE TO TEACHER. — Notice that the sign (\times) means "times" and that, in writing examples in multiplication, the abstract multiplier is written to the left, and the concrete multiplicand to the right, of the sign (\times).

Multiplication Table of Twos

Memorize this table :

$2 \times 1 = 2$

$2 \times 5 = 10$

$2 \times 9 = 18$

$2 \times 2 = 4$

$2 \times 6 = 12$

$2 \times 10 = 20$

$2 \times 3 = 6$

$2 \times 7 = 14$

$2 \times 11 = 22$

$2 \times 4 = 8$

$2 \times 8 = 16$

$2 \times 12 = 24$

NOTE TO TEACHER. — This table, as well as all other multiplication tables, should be memorized. The careful development of the steps of the table is necessary not only for the proper understanding of the meaning of the processes, but also as an instrument for the discovery of new or forgotten combinations. Development, however, while assisting the understanding, is of little use as an aid in memorizing the products. The tables must be memorized by means of daily drills. Many devices for drill may be found on pages 73, 76.

The teacher should ascertain the relations which are most difficult for individual pupils. Frequent individual drills should then be given on those relations. For example, $7 \times 8 = 56$. Drill: $8 \times 7 = ?$ How many 8's in 56? $7 \times ? = 56$. What numbers divide 56? $? \times ? = 56$, etc.




ORAL EXERCISE**APPLICATION — 2 TABLE**

1. I wrote 2 letters and put a 2-ct. stamp on each letter. How much money did I spend for stamps?
2. How much money is required to buy 2 eight-cent books?
3. How much do 2 pictures cost at 9 ct. each?
4. 1 pt. of milk costs 4 ct. How much do 2 pt. cost?

5. If George and Harry have 6 marbles each, how many marbles have the 2 boys?

6. Which is greater, 4×2 or 2×2 ? How much?

7. $14 \times 2 = 28$. How much is 15×2 ?

8.   
 2×3 pencils = 6 pencils. How many are
 4×3 pencils? Why?

(4×3 is twice as great as 2×3 .)

9. $2 \times 3 = ?$ How much is 6×3 ? 8×3 ?
 (Use splints.)

*Cross References: Division Table of Twos, page 106.
 One Half of Numbers, page 175.*

Multiplication Table of Threes

1. Count 4 three times. How much is 3 times 4?
 Count 7 three times. How much is 3 times 7?
 Count 10 three times. How much is 3 times 10?

2. By adding 2's, tell how much is 3×2 .

3. By adding 5's, tell how much is 3×5 .

4. By adding 7's, tell how much is 3×7 .

5. By adding 9's, tell how much is 3×9 .

Make the multiplication for three.

Compare your table with this table.

Multiplication Table of Threes

Memorize this table :

$$3 \times 1 = 3$$

$$3 \times 5 = 15$$

$$3 \times 9 = 27$$

$$3 \times 2 = 6$$

$$3 \times 6 = 18$$

$$3 \times 10 = 30$$

$$3 \times 3 = 9$$

$$3 \times 7 = 21$$

$$3 \times 11 = 33$$

$$3 \times 4 = 12$$

$$3 \times 8 = 24$$

$$3 \times 12 = 36$$

NOTE TO TEACHER. — See note on page 57.

In the expression

$$3 \times 7 = 21,$$

the number **3** is the **multiplier** ;

the number **7** is the **multiplicand** ;

the number **21** is the **product**.

In the example

Multiply **8** by **2**,

the number **8** is the **multiplicand** ;

the number **2** is the **multiplier** ;

the number **16** is the **product**.

ORAL EXERCISE

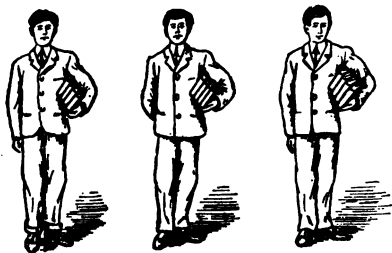
1. Tell the multipliers in the 3 table ; in the 2 table.

2. Tell the multiplicands in the 2 table ; in the 3 table.

ORAL EXERCISE

Application — 3 Table

1. Here are 3 boys. Each boy has 4 books. How many books in all?



2. Mary bought 3 loaves of bread for 6 ct. a loaf.

How much did the bread cost? How much change did she receive from 25 ct.?

3. A boy skates 4 blocks in 1 min. How far will he go in 3 min.?

4. Nellie had 3 examples correct each school day. How many correct examples in 5 days?

5. A class reads 3 pages in a reader each day for 9 days. How many pages are read?

6. How many pages would the class read in 11 days, *at the same rate*?

7. How much greater is 8×3 than 6×3 ? Give a reason for your answer.

8. $13 \times 3 = 39$. How much are 14 times 3? Give a reason.

9. Say the 2 table from 9×2 *down* to 3×2 .

10. Say the 3 table from 11×3 down to 2×3 .

11.



2 oranges cost
3 cents.



4 oranges cost?
Why?

12. $3 \times 6 = ?$ How much is 6×6 ? Why? (*Use splints.*)

13. $3 \times 10 = ?$ How much is 6×10 ? 12×10 ?
Why? (*Use splints.*)

Cross References: Division Table of Threes, page 109.

One Third of Numbers, page 182.

Multiplication Table of Fours

1. Count 7 four times. How much is 4 times 7?
Count 9 four times. How much is 4 times 9?
Count 11 four times. How much is 4 times 11?
Count 12 four times. How much is 4 times 12?

2. By adding 1's, 2's, 3's, 4's, 5's, etc., tell how much is

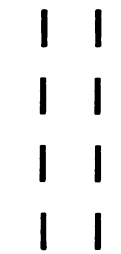
4×1 ; 4×2 ; 4×3 ; 4×4 ; 4×5 ; etc.

3. Make 2 rows of splints, putting 4 splints in a row. How many splints are used?

4. Make 4 rows of splints, putting 2 splints in a row. How many splints are used?



$$2 \times 4 = 8$$



$$4 \times 2 = 8$$

We see that $2 \times 4 = 4 \times 2$.

5. Arrange 8 blocks to show that $2 \times 4 = 4 \times 2$.
6. Arrange marbles or splints or pennies to show that
- $$1 \times 4 = 4 \times 1;$$
- $$2 \times 4 = 4 \times 2;$$
- $$3 \times 4 = 4 \times 3.$$

When two numbers like 3 and 4 are multiplied, the product is the same whether 4 is multiplied by 3, or 3 is multiplied by 4. $4 \times 3 = 12$; $3 \times 4 = 12$.

Multiplication Table of Fours

Memorize this table:

$4 \times 1 = 4$	$4 \times 5 = 20$	$4 \times 9 = 36$
$4 \times 2 = 8$	$4 \times 6 = 24$	$4 \times 10 = 40$
$4 \times 3 = 12$	$4 \times 7 = 28$	$4 \times 11 = 44$
$4 \times 4 = 16$	$4 \times 8 = 32$	$4 \times 12 = 48$

Tell all the multipliers in this table; the multiplicands; the products.

ORAL EXERCISE

Application—4 Table

1. A pint of milk costs 4 ct. How much will 2 pt. cost? 4 pt.?

2. It takes 4 yd. of cloth to make a suit for a boy. How many yards will be *required* to make suits for 3 boys? For 4 boys?

3. Jacob was not allowed to go out to play until he had *solved* 10 problems. He took 4 min. for each problem. How long did Jacob stay in?

4. Which is greater, 4×5 or 4×8 ? How much?

5. How much less is 4×1 than 4×6 ?

6. $4 \times 12 = 48$. How much is 4×13 ? 4×14 ?

7. $4 \times 20 = 80$. How much is 4×19 ? 4×18 ?

8. $4 \times 8 = 32$. How much is 8×8 ? Give a reason for your answer.

9. Say the 3 table from 12×3 down to 4×3 .

10. Say the 4 table from 8×4 to 4×4 .

11. Say the 4 table from 1×4 to 11×4 , skipping each second line. ($1 \times 4 = ?$ $3 \times 4 = ?$ $5 \times 4 = ?$ etc.)

12. Say the 4 table from 2×4 to 12×4 , skipping each second line.

13. If 4 pencils cost 3 ct., how much will 8 pencils cost? Why?



14. 3 pieces of dolls' soap cost 5 ct. 9 pieces will cost? Why?

Cross References: Division Table of Fours, page 112.

One Fourth of Numbers, page 184.

Multiplication Table of Fives

1. Count 6 five times. How much is 5 times 6?
Count 9 five times. How much is 5 times 9?
Count 12 five times. How much is 5 times 12?
2. How much is 2×5 ? How much is 5×2 ?
How much is 3×5 ? How much is 5×3 ?
How much is 4×5 ? How much is 5×4 ?
3. By adding 5's, 6's, 7's, 8's, etc., obtain answers for 5×5 , 5×6 , 5×7 , 5×8 , etc.

Multiplication Table of Fives

Memorize this table:

$5 \times 1 = 5$	$5 \times 5 = 25$	$5 \times 9 = 45$
$5 \times 2 = 10$	$5 \times 6 = 30$	$5 \times 10 = 50$
$5 \times 3 = 15$	$5 \times 7 = 35$	$5 \times 11 = 55$
$5 \times 4 = 20$	$5 \times 8 = 40$	$5 \times 12 = 60$

Hints for memorizing:

Look at the products in the table.

What is the last figure of the 1st, 3d, 5th, etc., product? Of the 2d, 4th, 6th, etc., product?

Tell how you can easily remember the products of the 5 table.

ORAL EXERCISE

Application—5 Table

1. How much greater is 8×5 than 4×5 ? Give the reason.

2. How much less is 2×5 than 9×5 ? Give the reason.

3. $14 \times 5 = 70$. How much is 15×5 ? 16×5 ? 17×5 ? Give a reason for each answer.

4. $19 \times 5 = 95$. How much is 18×5 ? 17×5 ? Give a reason for each answer.

5. $5 \times 4 = ?$ How much is 10×4 ? Why?

6. If 4 lead pencils cost 5 ct., how much do 8 lead pencils cost? Why?

7. At the rate of 2 bananas for 5 ct., how much will 4 bananas cost? 6 bananas? 8 bananas?

8. A boy walks 3 blocks in 5 min. How long will it take him to walk 6 blocks?

|—————|
3 blocks in 5 minutes.

|—————|—————|
6 blocks in ? minutes.

*Cross References: Division Table of Fives, page 115.
One Fifth of Numbers, page 184.*

Multiplication Table of Sixes

NOTE TO TEACHER. — When the class has advanced as far as the 6 table, pupils should be led to derive combinations like 6×6 and 6×8 in two ways: 1st, by means of equal addends, or by counting; 2d, by means of the relation of 6×6 to 6×2 or 6×3 , and of 6×8 to 6×2 or 6×4 . The second method relates the tables to one another and brings out the valuable idea of "ratio."

1. Count 6 six times. How much is 6×6 ?
Count 7 six times. How much is 6×7 ?
Count 8 six times. How much is 6×8 ?
2. Read page 62. Construct the first five steps of the 6 table yourself.
3. By adding 6's, 7's, 9's, etc., tell the remaining steps of the 6 table.

Multiplication Table of Sixes

Memorize this table:

$6 \times 1 = 6$	$6 \times 5 = 30$	$6 \times 9 = 54$
$6 \times 2 = 12$	$6 \times 6 = 36$	$6 \times 10 = 60$
$6 \times 3 = 18$	$6 \times 7 = 42$	$6 \times 11 = 66$
$6 \times 4 = 24$	$6 \times 8 = 48$	$6 \times 12 = 72$

Hints for memorizing:

$6 \times 2 = 12$	$6 \times 6 = 36$	$6 \times 10 = 60$
$6 \times 4 = 24$	$6 \times 8 = 48$	$6 \times 12 = 72$

Notice that

$2 \times 11 = 22$	$3 \times 11 = 33$	$4 \times 11 = 44$
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ORAL EXERCISE

Application — 6 Table

1. A man digs a trench 6 ft. long in an hour. How long a trench can he dig in 6 hr.? In 8 hr.?

2. Find the cost of 6 cups at 8 cents each.

3. If rubber erasers cost 6 ct. each, how much will 5 cost? 9? 12?



If 2 bottles of ink cost 5 ct., how much will 4 bottles cost?

5. If 2 bottles of ink cost 5 ct., how much will 6 bottles cost? 8 bottles?

6. A grocer buys 6 lemons for 2 ct. each. He sells them for 5 ct. each. How much is his profit? (*Use direct method.*)

7. If a man can make 6 coats in 7 da., how many days will be required to make 12 coats at the same rate? 18 coats? 36 coats?

8. How much will 6 chairs cost at \$6 each? at \$8 each? at \$12 each?

Multiplication Tables of Sevens, Eights, Nines, and Tens

Construct the Multiplication Tables of Sevens, Eights, Nines, and Tens.

Multiplication Table of Sevens

Memorize this table:

$7 \times 1 = 7$	$7 \times 5 = 35$	$7 \times 9 = 63$
$7 \times 2 = 14$	$7 \times 6 = 42$	$7 \times 10 = 70$
$7 \times 3 = 21$	$7 \times 7 = 49$	$7 \times 11 = 77$
$7 \times 4 = 28$	$7 \times 8 = 56$	$7 \times 12 = 84$

Multiplication Table of Eights

Memorize this table:

$8 \times 1 = 8$	$8 \times 5 = 40$	$8 \times 9 = 72$
$8 \times 2 = 16$	$8 \times 6 = 48$	$8 \times 10 = 80$
$8 \times 3 = 24$	$8 \times 7 = 56$	$8 \times 11 = 88$
$8 \times 4 = 32$	$8 \times 8 = 64$	$8 \times 12 = 96$

TO THE TEACHER. — Read note on page 66.

Multiplication Table of Nines

Memorize this table:

$9 \times 1 = 9$	$9 \times 5 = 45$	$9 \times 9 = 81$
$9 \times 2 = 18$	$9 \times 6 = 54$	$9 \times 10 = 90$
$9 \times 3 = 27$	$9 \times 7 = 63$	$9 \times 11 = 99$
$9 \times 4 = 36$	$9 \times 8 = 72$	$9 \times 12 = 108$

TO THE TEACHER. — Read note on page 66.

Multiplication Table of Tens

Memorize this table:

$10 \times 1 = 10$	$10 \times 5 = 50$	$10 \times 9 = 90$
$10 \times 2 = 20$	$10 \times 6 = 60$	$10 \times 10 = 100$
$10 \times 3 = 30$	$10 \times 7 = 70$	$10 \times 11 = 110$
$10 \times 4 = 40$	$10 \times 8 = 80$	$10 \times 12 = 120$

TO THE TEACHER. — Read note on page 66.

ORAL EXERCISE

Application — 7, 8, 9, 10 Tables

1. Each *goal* in a basket-ball game counts 2 points. Our team made 7 goals, the other team made 5 goals. What was the score of the game?

2. If the first team had made 7 goals and the second team 6 goals, how many more points would the first team have than the second? (*Use direct method.*)

3. If 2 boxes of crackers weigh 7 lb., how much will 4 boxes of crackers weigh? 6 boxes? 14 boxes?

4. A boy earns \$12 in 2 wk. How much does he earn in 14 wk. at the same rate?

5. If a storekeeper buys 8 doz. picture cards at 10 ct. a dozen, and sells them at 16 ct. a dozen, how much does he gain? (*Use direct method.*)

NOTE TO TEACHER. — Hint for memorizing: Show the scholars the following in reference to the 9 table.

(a) The units' digits in each product decreases by 1. ($9 - 8 - 7 - 6 - 5 - 4 - 3 - 2 - 1 - 0$; $9 - 8$.)

(b) The tens' digits increases by 1 through 9×10 .

(c) The sum of the digits in each product (except 99) equals 9.

Look at the products of the 10 table.

$$10 \times 1 = 10 \quad 10 \times 2 = 20 \quad 10 \times 3 = 30$$

Tell an easy way to remember the products of the 10 table.

6. Find the cost of the following articles:

8 doz. pens at 12 ct. a dozen,
8 bottles of mucilage at 9 ct. apiece,
8 brushes at 8 ct. apiece.

7. If I pay 8 ct. for 3 eggs, how much will I pay for 6 eggs at the same rate?

8. If I pay 8 ct. for 3 eggs, how much will I pay for 9 eggs? 12 eggs? 18 eggs? 24 eggs?

9. The Howard Baseball Club played a 9-inning game. Each inning required 12 min. How long did the game last?

10. There are 3 ft. in a yard. How many feet in 9 yd.?

11. How many more feet are there in 9 yd. than in 5 yd.? (*Use direct method.*)

12. Find the cost of the following:

9 lb. raisins at 9 ct. per pound,
9 lb. dates at 10 ct. per pound,
9 lb. prunes at 9 ct. per pound,
6 doz. jars of jelly at 9 ct. each.

13. If 4 pr. of shoes cost \$9, how much will 12 pr. cost at the same rate? 36 pr.? Why? (*Use direct method.*)

14. If 5 doz. handkerchiefs cost \$9, how much will 15 doz. cost at the same rate? 25 doz.? 45 doz.? 50 doz.?

15. Name 6 articles, each of which costs 10 ct. Make two multiplication problems about each article. Solve the problems.

16. A newsboy buys 10 magazines at 8 ct. each. He sells them at 10 ct. each. Make 2 problems from this and solve them.

17. If 3 books cost 10 ct., how much will 18 books cost? 21 books? 30 books? 60 books?

18. If the profit on 3 cakes of soap is 10 ct., how much profit will be made on 12 cakes of soap? On 18 cakes? On 24 cakes? On 30 cakes?

Cross References:
Division Table of Sevens, page
 118.
Division Table of Eights, page
 118.

One Eighth of Numbers, page
 198.
Division Table of Nines, page
 118.
Division Table of Tens, page 118.

Multiplication Table of Elevens

Construct the 11 table.

Multiplication Table of Elevens

Memorize this table:

$11 \times 1 = 11$	$11 \times 5 = 55$	$11 \times 9 = 99$
$11 \times 2 = 22$	$11 \times 6 = 66$	$11 \times 10 = 110$
$11 \times 3 = 33$	$11 \times 7 = 77$	$11 \times 11 = 121$
$11 \times 4 = 44$	$11 \times 8 = 88$	$11 \times 12 = 132$

Hints for memorizing: See page 66.

Multiplication Table of Twelves

Construct the 12 table.

Multiplication Table of Twelves

Memorize this table:

$12 \times 1 = 12$

$12 \times 5 = 60$

$12 \times 9 = 108$

$12 \times 2 = 24$

$12 \times 6 = 72$

$12 \times 10 = 120$

$12 \times 3 = 36$

$12 \times 7 = 84$

$12 \times 11 = 132$

$12 \times 4 = 48$

$12 \times 8 = 96$

$12 \times 12 = 144$

TO THE TEACHER. — Read note on page 66.

ORAL EXERCISE**Application — 11, 12 Tables**

1. Fill in the blank spaces and solve.

I buy — yd. of calico at 11 ct. a yard. Find the total cost.

I buy — yd. of muslin at 8 ct. a yard. Find the total cost.

I buy — yd. of — at — ct. a yard. Find the total cost.

2. If 3 whistles cost 11 ct., how much will 15 whistles cost? 9 whistles? 33 whistles?

3. If 5 tops cost 11 ct., how much will 15 tops cost? 35 tops? 55 tops? 60 tops?

4. How many papers in 6 doz.? 5 doz.? 7 doz.? 10 doz.? 12 doz.?

5. At 1 ct. each, how much will 4 doz. straps cost? 8 doz.? 12 doz.?

6. If a thimble costs 9 ct., how much will a dozen thimbles cost?

7. If 12 lb. of coffee are bought at 23 ct. a pound, and sold at 35 ct. a pound, how much money is gained?

Cross References : Division Table of Elevens, page 122.

Division Table of Twelves, page 122.

Review of Multiplication Tables through 12

ORAL DRILL

Begin at the right. Multiply each number in the upper line by the number in the lower line. Tell the products instantly.

$$\begin{array}{r} 1. \quad 9 \ 3 \ 7 \ 2 \ 8 \ 5 \ 6 \ 4 \ 1 \\ \quad \times 2 \\ \hline \end{array} \quad \begin{array}{r} 2. \quad 9 \ 3 \ 7 \ 2 \ 8 \ 5 \ 6 \ 4 \ 1 \\ \quad \times 3 \\ \hline \end{array}$$

3. Multiply each number in the upper line of example 2 by 4, by 5, by 6, by 7, etc., through 12.

ORAL DRILL

Multiply each number by the number in the rectangle. Tell the products instantly.

2	7	1	4
5		X 2	8
6	9	0	8

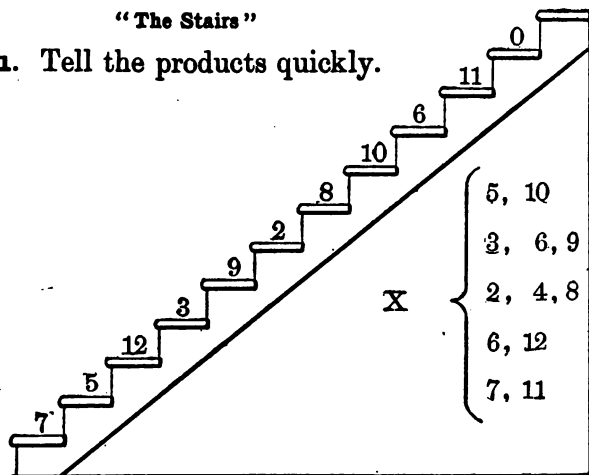
2	7	1	4
5		X 3	8
6	9	0	8

2	7	1	4
5		X 4	8
6	9	0	8

2	7	1	4
5		X 5	8
6	9	0	8

"The Stairs"

1. Tell the products quickly.

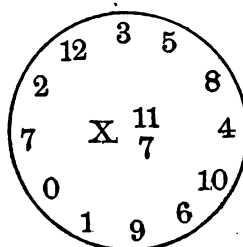
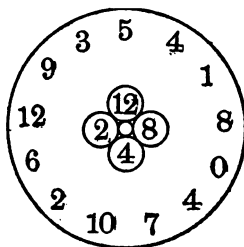
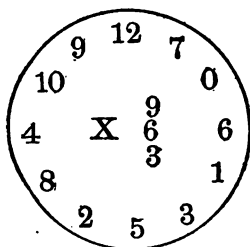


ORAL DRILL

"The Circle"

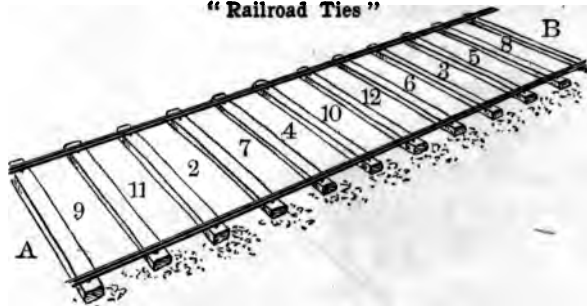
Multiply each number on the circumference by each number in the center of the circle.

Tell the products only.



ORAL DRILL

"Railroad Ties"



Go from *A* to *B* as quickly as possible, then back from *B* to *A*.

Multiply by 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

ORAL DRILL

(Products less than 50.)

Tell products at once:

- | | | |
|--------------------|---------------------|---------------------|
| 1. 2×3 . | 11. 4×5 . | 21. 10×4 . |
| 2. 6×8 . | 12. 2×9 . | 22. 8×2 . |
| 3. 5×4 . | 13. 3×9 . | 23. 7×7 . |
| 4. 2×8 . | 14. 2×7 . | 24. 3×6 . |
| 5. 4×6 . | 15. 2×12 . | 25. 5×6 . |
| 6. 7×3 . | 16. 5×5 . | 26. 11×4 . |
| 7. 9×2 . | 17. 6×7 . | 27. 12×2 . |
| 8. 4×4 . | 18. 8×3 . | 28. 8×6 . |
| 9. 6×1 . | 19. 9×4 . | 29. 9×3 . |
| 10. 7×5 . | 20. 12×3 . | 30. 9×5 . |

ORAL DRILL

Give the missing numbers.

- | | | |
|-----------------------|-----------------------|-------------------------|
| 1. $* \times 4 = 48.$ | 4. $* \times 3 = 21.$ | 7. $* \times 9 = 36.$ |
| $* \times 4 = 36.$ | $* \times 3 = 27.$ | $* \times 9 = 63.$ |
| $* \times 4 = 44.$ | $* \times 3 = 36.$ | $* \times 9 = 81.$ |
| $* \times 4 = 28.$ | $* \times 3 = 30.$ | $* \times 9 = 108.$ |
| $* \times 4 = 20.$ | $* \times 3 = 24.$ | $* \times 9 = 54.$ |
| $* \times 4 = 24.$ | $* \times 3 = 18.$ | $* \times 9 = 45.$ |
| 2. $* \times 6 = 36.$ | 5. $* \times 7 = 28.$ | 8. $* \times 11 = 88.$ |
| $* \times 6 = 48.$ | $* \times 7 = 84.$ | $* \times 11 = 22.$ |
| $* \times 6 = 60.$ | $* \times 7 = 70.$ | $* \times 11 = 121.$ |
| $* \times 6 = 72.$ | $* \times 7 = 56.$ | $* \times 11 = 77.$ |
| $* \times 6 = 42.$ | $* \times 7 = 42.$ | $* \times 11 = 44.$ |
| 3. $* \times 8 = 24.$ | 6. $* \times 5 = 25.$ | 9. $* \times 12 = 144.$ |
| $* \times 8 = 96.$ | $* \times 5 = 45.$ | $* \times 12 = 120.$ |
| $* \times 8 = 72.$ | $* \times 5 = 20.$ | $* \times 12 = 96.$ |
| $* \times 8 = 56.$ | $* \times 5 = 35.$ | $* \times 12 = 72.$ |
| $* \times 8 = 40.$ | $* \times 5 = 40.$ | $* \times 12 = 132.$ |

ORAL DRILL

What 2 numbers may be multiplied together to give these products?

- | | | | | | |
|-------|----|-----|--------|-----|-----|
| 1. 24 | 28 | 32 | 6. 54 | 63 | 70 |
| 2. 25 | 35 | 120 | 7. 72 | 80 | 81 |
| 3. 27 | 36 | 40 | 8. 84 | 88 | 96 |
| 4. 30 | 60 | 64 | 9. 48 | 90 | 66 |
| 5. 42 | 49 | 56 | 10. 36 | 144 | 108 |

Oral Review. Multiplication Tables. Problems

1. Grace walks 6 blocks to school. Mary walks 3 times as far. Make 2 problems from this. Solve each problem.

2. One can will hold 3 qt. of milk. A second can will hold 4 times as much. How many pints can be poured into the second can?

3. A man can build a fence 5 yd. long in 3 hr. How long will it take him at that rate to build a fence 15 yd. long?

4. Ribbon is bought for 4 ct. a yard and sold for 7 ct. a yard. Find the profit on 3 yd.; on 9 yd.; on 12 yd. (*Use direct method of solution.*)

5. The price of a ride in a trolley car was reduced from 5 ct. to 3 ct. How much is saved on 5 rides? On 8 rides? On 10 rides? On 12 rides? (*Use direct method of solution.*)

6. A storekeeper bought eggs at 4 ct. each; he sold them at 6 ct. each. Find the gain on 9 eggs. (*Use direct method of solution.*)

7. If 3 eggs cost 11 ct., how much will 6 eggs cost? 9 eggs? 12 eggs?

8. One store charges 14 ct. for a ball of cord. Another store charges only 8 ct. How much do I save if I purchase 6 balls at the cheaper price? 9 balls? 12 balls? (*Use direct method of solution.*)

9. Fred bought 1 doz. boxes of caps at 2 ct. a box and 1 doz. toy pistols at 5 ct. each. How much money did Fred spend?

10. Jack bought 9 packs of firecrackers. They were sold at the rate of 3 packs for 5 cents. How much did Jack spend?

11. At the rate of 5 ct. for 3 packs of firecrackers, how much do 6 packs cost? 9 packs? 15 packs? 24 packs?

2 for 5 cents



3 for 5 cents



3 for 10 cents



4 for 10 cents



12. If 2 bananas cost 5 ct., find the cost of 10 bananas; of 6 bananas; of 24 bananas.

13. If 3 lemons cost 5 ct., find the cost of 12 lemons; of 15 lemons; of 21 lemons.

14. If 3 pears cost 10 ct., find the cost of 9 pears; of 21 pears; of 30 pears; of 36 pears.

15. If 4 oranges cost 10 ct., find the cost of 12 oranges; of 24 oranges; of 32 oranges.

16. If $\frac{1}{2}$ doz. apples cost 10 ct., find the cost of 1 doz. apples; of 3 doz. apples.

Multiplicand of Two Orders: Multiplier of One Order

A. A baseball bat costs 32 ct. How much will 3 bats cost?

EXPLANATION OR FORM OF ANALYSIS. 3 bats will cost 3 times as much as 1 bat.

Therefore, 3 bats will cost 3×32 ct.

Multiplicand: 32 ct. = 30 ct. + 2 ct.

Multiplier:

Multiply by 3:
$$\begin{array}{r} 3 \\ 90 \text{ ct.} + 6 \text{ ct.} = 96 \text{ ct. cost.} \end{array}$$

A shorter way is:

Multiplicand: 32 ct.

Multiplier: $\begin{array}{r} 3 \\ \hline \end{array}$

96 ct. *Ans.*

Begin at the right

3 times 2 units = 6 units

3 times 3 tens = 9 tens

96 ct. *Ans.*

(Say, "Three 2's are 6; three 3's are 9.")

B. A train travels 18 mi. in an hour. How many miles will it travel in 9 hr. at that rate?

EXPLANATION OR FORM OF ANALYSIS. In 9 hr. the train will travel 9 times as far as it travels in 1 hr.

Therefore, the distance will be 9 times 18 mi.

Multiplicand: 18 mi. = 10 mi. + 8 mi.

Multiplier:

$$\begin{array}{r} 9 \\ 90 \text{ mi.} + 72 \text{ mi.} = 162 \text{ mi.} \end{array}$$

or.

Multiplicand: 18 mi.

Multiplier: $\begin{array}{r} 9 \\ \hline \end{array}$

9×8 units

72

9×1 ten

90

9×18 mi. = 162 mi. *Ans.*

A shorter way is:

Multiplicand: 18 mi.

Multiplier: $\underline{9}$

162 mi. *Ans.*

Say, "Nine 8's are 72;
put down 2 and carry 7;
nine 1's are 9. $9 + 7 = 16$."

Begin at the right

9×8 units = 72 units;
put down 2 and carry 7
tens; 9×1 ten = 9 tens;
9 tens + 7 tens = 16 tens;
16 tens = 1 hundred and
6 tens. 162 mi. *Ans.*

C. A man pays \$30 each month for rent. How much does he pay in 8 mo.?

EXPLANATION OR FORM OF ANALYSIS. The rent for 8 mo. will be 8 times the rent for 1 mo.

Therefore, the total rent will be 8 times \$30.

Begin at the right

Multiplicand: \$30

Multiplier: $\underline{8}$

\$240

8×0 units = 0 units

8×3 tens = 24 tens

24 tens = 2 hundreds and
4 tens

Cross References: Divisor of One Order, page 130.

Fractions, pages 175-190.

A short way to multiply \$30 by 8 is to multiply \$3 by 8 (\$24) and to annex 0 to the product. \$240 is the answer.

D. Roses cost 15 ct. each. How much will 9 roses cost?

Multiplicand: \$.15

$\underline{9}$

135 ct.

or \$1.35

Write the decimal point in the product directly under the decimal point in the multiplicand.

/

Proof in Multiplication

On page 80 we learned that $3 \times 32 = 96$.

To prove that the answer is correct, we add 32 three times.

32

32

32

96

correct.

ORAL EXERCISE

How much is :

1. 5×14 ? 5×15 ? 5×16 ? 5×17 ? 5×18 ?

2. 4×22 ct.? $4 \times \$21$? 4×20 apples?
 4×19 qt.? 4×18 marbles?

3. 6×30 ? 6×35 ? 6×40 ? 6×45 ? 6×50 ?

4. 3×21 ct.? 3×22 pt.? $3 \times \$23$? 3×24 ft.?
 3×25 bu.?

5. 8×15 ? 8×20 ? 8×25 ? 8×30 ? 8×35 ?

ORAL PROBLEMS

1. George buys 2 pk. of potatoes. How many quarts does he buy?

2. If each peck costs 24 ct., how much does he pay for the 2 pk.?

3. How many pencils are contained in 5 packages, if each package contains 18 pencils?

4. If each pencil costs 3 ct., how much will a package cost?

5. If a storekeeper makes 2 ct. profit on each pencil, how much profit does he make by selling 30 pencils?

WRITTEN EXERCISE

How much is:

1. 5×28 ? 5×29 ? 5×26 ? 5×25 ? 5×24 ?
2. 9×36 ct.? 9×46 pears? 9×56 boys?
 $9 \times \$66$? 9×76 horses?
3. 7×56 ? 7×57 ? 7×58 ? 7×59 ? 7×60 ?
4. 8×42 ? 8×44 ? 8×46 ? 8×48 ? 8×50 ?
5. 6×66 ct.? $6 \times \$56$? 6×46 trees? 6×36 in.
 6×26 yd.?

WRITTEN PROBLEMS

1. There are 32 qt. in a bushel of apples. Find the value of a bushel of apples at 9 ct. a quart.
2. How many pecks in 25 bu.?
3. 9 baskets are filled with peaches. Each basket contains 28 peaches. How many peaches in all?
4. At \$82 each, find the cost of 8 typewriters.
5. If 3 yd. of lace cost 16 ct., find the cost of 12 yd. at the same rate; of 15 yd.; of 18 yd.

ORAL EXERCISE

1. $5 \times 24 = ?$ $5 \times 34 = ?$ $5 \times 44 = ?$ $5 \times 54 = ?$
2. $5 \times 40 \text{ ct.} = ?$ $8 \times 40 \text{ ct.} = ?$ $7 \times 40 \text{ ct.} = ?$
3. What is the product of 50 and 6? 50 and 7? 50 and 8? 50 and 9?
4. Multiply 40 by 8; by 9; by 7; by 6.
5. How much are 6 times 60? 7 times 60? 8 times 60? 10 times 60?

ORAL PROBLEMS

1. Handkerchiefs cost 25 ct. each. Find the cost of 6.
2. How many minutes are there in 9 hr.?
3. At 40 ct. a dozen, find the cost of 3 doz. eggs; of 6 doz.; of 8 doz.; of 15 doz.
4. 3 books cost 60 ct. Find the cost of 19 books at that rate; of 15 books.

WRITTEN PROBLEMS

1. How many quarts in 19 pk.?
2. At \$21 a dozen, find the cost of 9 doz. plates; of 10 doz.
3. 65 ft. of lumber are used to build a fence. How many feet are necessary for a fence 8 times as large?
4. If 5 clocks cost \$79, how much will 20 clocks cost at that rate?

Multiplicand of Three or More Orders: Multiplier of One Order

A. There are 365 da. in 1 yr. How many days are there in 3 yr.?

EXPLANATION OR FORM OF ANALYSIS. In 3 yr. there are 3 times as many days as there are in 1 yr. Therefore, the number of days will be 3×365 .

$$365 \text{ da.} = 300 \text{ da.} + 60 \text{ da.} + 5 \text{ da.}$$

$$\begin{array}{r} 3 \\ 900 \text{ da.} + 180 \text{ da.} + 15 \text{ da.} = 1,095 \text{ da.} \end{array}$$

A shorter way is the following:

Multiplicand: 365 da.

Multiplier: $\begin{array}{r} 3 \\ \hline 1,095 \end{array}$ da.

3×5 units = 15 units = 1 ten and 5 units;
 put down 5 and carry 1;
 3×6 tens = 18 tens;
 18 tens + 1 ten = 19 tens;
 19 tens = 1 hundred and 9 tens;
 put down 9 and carry 1;
 3×3 hundreds = 9 hundreds;
 9 hundreds + 1 hundred = 10 hundreds = 1 thousand and 0 hundreds.
 1,095 da. Ans.

B. A man receives \$2.25 for a day's work. How much will he receive for 6 days' work?

\$2.25

6

$\$13.50$

Amount for 6 days' work. *tiplicand.*

Write the decimal point in the answer below the decimal point in the mul-

*Cross References: Divisor of One Order, page 130.
 Fractions, pages 175-199.*

NOTE TO TEACHER.—An elementary knowledge of the Law of Commutation should be developed, because many examples can be solved easily by the application of this principle; *e.g.* *A baker bakes 1,826 loaves; each loaf weighs 3 lb. What is the total weight?* Logically, the solution is $1,826 \times 3$ lb. If, however, the pupils understand that $1,826 \times 3$ lb. = $3 \times 1,826$ lb., they may obtain the answer by multiplying 1,826 by 3 instead of multiplying 3 by 1,826.

The term "Law of Commutation" should not be taught.

ORAL EXERCISE

1. Multiply:

123	123	123	123	123
<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>

2.

Multiplicand	\$2.34	\$3.24	\$4.32	\$2.43	\$3.45
Multiplier	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>
Product	?	?	?	?	?

3.

Multiplicand	\$4.56	\$2.45	\$4.08	\$6.13	\$9.15
Multiplier	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
Product	?	?	?	?	?

4.

Multiplicand	645 bbl.	709 ft.	812 apples	625 yd.
Multiplier	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Product	?	?	?	?

ORAL PROBLEMS

1. A fire department has 112 engines. Each engine requires 2 horses. How many horses are needed for all the engines?

2. How many cars are there in 120 trains if each train consists of 7 cars?

3. A school contains 950 children. Each child uses 3 pads of paper a term. How many pads are used?

4. A wagon carries 7 boxes of oranges. Each box contains 140 oranges. How many oranges in all?

5. A train travels 105 mi. in 5 hr. At that rate, how far will it travel in 10 hr.? in 20 hr.?

WRITTEN EXERCISE

Multiply:

1. 286	597	738	849	679
<u>2</u>	<u>4</u>	<u>6</u>	<u>8</u>	<u>7</u>

2. \$7.29	\$9.38	\$4.57	\$8.39	\$6.78
<u>5</u>	<u>7</u>	<u>3</u>	<u>9</u>	<u>8</u>

3. 429	369	742	913	209
<u>7</u>	<u>5</u>	<u>8</u>	<u>6</u>	<u>3</u>

4. 355 men	426 qt.	837 ft.	297 lb.	678 yd.
<u>4</u>	<u>6</u>	<u>9</u>	<u>7</u>	<u>8</u>

5. 297	385	629	876	934
<u>6</u>	<u>5</u>	<u>7</u>	<u>4</u>	<u>3</u>

WRITTEN PROBLEMS

1. A wagon carries 5 boxes, each box weighing 376 lb. What is the entire weight of the load?
2. There were 392 cakes of ice in each of 6 ice boats. How many cakes of ice in all the boats?
3. A coil of wire contains 3756 ft. How many feet in 7 coils of the same size?
4. A town had a population of 828 people. To-day the population is 6 times as large. What is the population to-day?
5. A train travels 173 mi. in 6 hr. At that rate, how far will it travel in 12 hr.? in 24 hr.?

ORAL EXERCISE

Find the products of :

1. 321 multiplied by 2, by 3, by 4, by 6, by 8.
2. \$4.15 multiplied by 3, by 6, by 9, by 4, by 8
3. 625 multiplied by 8, by 4, by 9, by 3, by 7.
4. \$9.80 multiplied by 4, by 3, by 6, by 2, by 8.
5. 230 multiplied by 2, by 4, by 5, by 7, by 9.

ORAL PROBLEMS

1. A grocer sells 8 packages of oatmeal a day. How many will he sell in 150 da. at that rate?
2. At the beginning of the year a man had 160 chickens. At the end of the year he had 3 times as many. How many chickens did he have at the end of the year?

3. A large store has 135 delivery wagons. Two boys work on each wagon. How many boys are employed?

4. A steamship company has 6 large ships. Each ship requires 130 men. How many men are needed for the 6 ships?

5. An engine uses 132 T. of coal in 8 weeks. At that rate, how many tons will be used in 16 weeks? in 24 weeks?

WRITTEN EXERCISE

$$\begin{array}{lll} 1. \quad 736 \times 8 = ? & 594 \times 7 = ? & 379 \times 6 = ? \\ 387 \times 5 = ? & 983 \times 2 = ? & 204 \times 9 = ? \end{array}$$

2. Multiplicand	\$896	\$7.53	\$295	\$6.84	\$229
Multiplier	<u>4</u>	<u>7</u>	<u>5</u>	<u>3</u>	<u>6</u>
Product	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

3. Find the products of the following numbers :

659 and 4.	294 and 9.	595 and 5.
836 and 9.	398 and 7.	356 and 7.

4. Multiply :

768	534	277	930	826
<u>5</u>	<u>7</u>	<u>3</u>	<u>6</u>	<u>8</u>

5. Multiply :

320 lb.	630 bu.	515 yd.	728 min.	144 in.
<u>9</u>	<u>3</u>	<u>6</u>	<u>8</u>	<u>7</u>

WRITTEN PROBLEMS

1. A coal dealer delivered 763 T. of coal every day for 5 da. Find the total amount of coal delivered.
2. A wagon weighs 237 lb. Find the weight of 9 such wagons.
3. 3 bags of corn weigh 126 lb. How much will 9 bags weigh at that rate? 15 bags? 21 bags?
4. A man saved \$894 in 3 yr. At that rate, how much will he save in 12 yr.? in 18 yr.?
5. One wagon carries 9 boxes; each box weighs 762 lb. Another wagon carries 9 boxes; each box weighs 369 lb. How much less weight is carried by the second wagon than by the first wagon?

ORAL EXERCISE

- | | | |
|-----------------------------|----------------------------|-----------------------|
| 1. $452 \times 3 = ?$ | $350 \times 4 = ?$ | $620 \times 6 = ?$ |
| $845 \times 3 = ?$ | $510 \times 9 = ?$ | $120 \times 4 = ?$ |
| 2. $4 \times \$2.05 = ?$ | $8 \times \$2.05 = ?$ | $7 \times \$312 = ?$ |
| $6 \times \$715 = ?$ | $9 \times \$8.40 = ?$ | $3 \times \$7.30 = ?$ |
| 3. $430 \times 6 = ?$ | $730 \times 8 = ?$ | $250 \times 9 = ?$ |
| $316 \times 3 = ?$ | $405 \times 4 = ?$ | $820 \times 6 = ?$ |
| 4. 2×375 books = ? | 4×550 pencils = ? | |
| 3×750 shoes = ? | 8×800 apples = ? | |
| 6×425 yd. = ? | 4×325 in. = ? | |
| 5. $330 \times 4 = ?$ | $430 \times 5 = ?$ | $630 \times 7 = ?$ |
| $730 \times 8 = ?$ | $530 \times 6 = ?$ | $510 \times 3 = ?$ |

WRITTEN EXERCISE

1. Multiply:

3874 sq. in.	6918 sq. ft.	7316 cu. in.	5280 cu. ft.
<u>9</u>	<u>4</u>	<u>6</u>	<u>8</u>

2. Multiply:

\$ 76.28	\$ 8402	\$ 1979	\$ 2900	\$ 83.16
<u>2</u>	<u>8</u>	<u>3</u>	<u>5</u>	<u>7</u>

3.

Multiplicand	9683 in.	1217 yd.	3645 ft.	8667 bu.
Multiplier	<u>3</u>	<u>9</u>	<u>7</u>	<u>4</u>
Product	<u>29</u>	<u>?</u>	<u>?</u>	<u>?</u>

4. Multiply: 749 and 6; 3804 and 5;
1936 and 7; 4218 and 9.

5.

Multiplicand	\$35.56	\$82.17	\$9698	\$4702	\$36.07
Multiplier	<u>3</u>	<u>8</u>	<u>9</u>	<u>7</u>	<u>4</u>
Product	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

6.

Multiplicand	\$237.46	\$396.05	\$831.98	\$74,762
Multiplier	<u>5</u>	<u>6</u>	<u>8</u>	<u>2</u>
Product	<u>?</u>	<u>?</u>	<u>?</u>	<u>?</u>

7. Find the products of:

$$28,496 \times 3 = ? \quad 34,207 \times 6 = ? \quad 83,614 \times 5 = ?$$

$$97,386 \times 7 = ? \quad 47,309 \times 9 = ? \quad 89,315 \times 6 = ?$$

8. Find the products of:

$$38,402 \text{ multiplied by } 8. \quad 28,315 \text{ multiplied by } 5.$$

$$75,976 \text{ multiplied by } 6. \quad 29,864 \text{ multiplied by } 9.$$

WRITTEN PROBLEMS

1. A freight train consists of 7 cars. Each car carries 196 bbl. of lime. How many barrels are in the 7 cars?

2. A printing press prints 2,364 papers in an hour. How many will it print in 8 hr. at that rate?

3. 9 car-loads consisting of coal and dirt were taken from a mine. Each load weighed 1,738 lb. If there were 150 lb. of dirt in each load, what was the weight of the coal in the 9 loads?

4. On Monday a coal dealer delivered 3 loads of coal, on Tuesday 2 loads, on Wednesday 4 loads. Each load weighed 5,250 lb. What was the total weight of the coal?

5. A ship costs \$265,000. Find the cost of 6 ships at that rate.

6. The population of a part of a city was 225,000, and the population of the whole city was as great. Find the population of the city.

7. A railroad has 1,200 miles of track. A second railroad has 3 times as many miles of track. A third railroad has twice as many miles of track as the second railroad. How many miles of track has the third railroad? How many miles of track have the 3 railroads, together?

To Multiply by 10

Review the multiplication table of tens, page 68.

How much is 10×4 ? 10×7 ? 10×5 ? 10×9 ?
 10×10 ? 10×11 ? 10×12 ?

Count by 10's to 150; to 160; to 170; to 190.

How much is 10×15 ? 10×16 ? 10×17 ? 10×19 ?

Multiply 48 by 10.

$$\begin{array}{r}
 48 \\
 \underline{10} \\
 10 \times 8 \text{ units} = 80 \\
 10 \times 4 \text{ tens} = 40 \\
 \hline
 10 \times 48 = 480
 \end{array}$$

A short way to multiply by 10 is to annex 0 to the multiplicand, e.g. $56 \times 10 = 560$; $748 \times 10 = 7,480$.

Cross References: Division by 10, page 145.

Division Table of Tens, page 118.

Multiply \$3.25 by 10.

$$\begin{aligned}
 \$3.25 &= 325 \text{ cents.} & 10 \times 325 \text{ cents} &= 3,250 \text{ cents.} \\
 & & 3,250 \text{ cents} &= \$32.50.
 \end{aligned}$$

To multiply a number containing dollars and cents by 10, annex 0 to the multiplicand and move the decimal

point one place to the RIGHT ; e.g. $\$7.48 \times 10 = \74.80 ;
 $\$276.18 \times 10 = \$2,761.80$.

To Multiply by 20, 30, 40, etc. . . . 90

Multiply 36 by 40.

First multiply 36 by 10, obtaining 360. Since $40 = 4 \times 10$, the answer will be 4×360 or 1,440.

A short way is

$$\begin{array}{r} 36 \\ 40 \\ \hline 1,440 \end{array}$$

To multiply by 20, 30, 40, etc., arrange the example in this way :

$$\begin{array}{r} 60 \\ 30 \\ \hline 1800 \end{array} \qquad \begin{array}{r} 97 \\ 80 \\ \hline 7760 \end{array}$$

EXERCISE

Multiply the following numbers by 10 ; by 20 ; by 30 :

1. 275 ; 386 ; 1742 ; 8396 ; 10,105.

Multiply the following numbers by 40 ; by 50 ; by 60 :

2. 1802 ; 6913 ; 7415 ; 8312 ; 76,194.

Multiply the following numbers by 70 ; by 80 ; by 90 :

3. 938 ; 402 ; 7365 ; 9437 ; 8609.

Multiplicand of Two or Three Orders: Multiplier of Two Orders

A. How much do 27 coats cost at \$18 each?

EXPLANATION OR FORM OF ANALYSIS. 27 coats will cost 27 times as much as 1 coat costs.

Therefore, the cost will be $27 \times \$18$.

Multiplicand:	\$18
Multiplier:	27
18 multiplied by 7 units	126
18 multiplied by 2 tens (20)	360
<u>\$18 multiplied by 2 tens 7 units</u>	<u>\$486</u>

A short way is to omit 0 and to arrange the work in this way:

$$\begin{array}{r}
 \$18 \\
 27 \\
 \hline
 126 \\
 36 \\
 \hline
 \$486
 \end{array}$$

B. In a country town there are 976 people; in a city near it there are 48 times as many people. What is the population of the city.

EXPLANATION. Give your own explanation.

		A shorter way
Multiplicand:	976 people	is to omit 0.
Multiplier:	48	976 people
976 \times 8 units	7808	48
976 \times 4 (tens)	39040	7808
	46848 people	3904
		<u>46848</u> people

Cross Reference: Divisor of Two Orders, page 148.

Proof in Multiplication

On page 82 we learned one method of proving an example in multiplication.

A shorter method of proof is:

Multiply 52 by 68.

To prove the example,
multiply 68 by 52.

$$\begin{array}{r} 52 \\ 68 \\ \hline 416 \\ 312 \\ \hline 3536 \end{array}$$

$$\begin{array}{r} 68 \\ 52 \\ \hline 136 \\ 340 \\ \hline 3536 \end{array}$$

If the same answer is obtained in the second example as in the first, the work is correct.

NOTE TO TEACHER. — This form of proof is based on the principle of commutation. See page 86.

Cross Reference: Proof in Division, page 131.

ORAL PROBLEMS

These prices are taken from a catalogue of a stationery store :

Calendars	20 ct. each.
Ink wells	50 ct. each.
Mucilage	5 ct. a bottle.
Blotters	10 ct. a hundred.
Paperweights . .	30 ct. each.
School Sponges . .	18 ct. a dozen.
Paper Fasteners . .	70 ct. a thousand.

Make 2 problems about each article, using numbers greater than 12. Solve each problem.

ORAL PROBLEMS

A grocer charged these prices:

Oatmeal	7 ct. a pound.
Hominy	5 ct. a pound.
Pepper	10 ct. a $\frac{1}{4}$ lb.
Salt	15 ct. a bag.
Sugar	18 ct. for $3\frac{1}{2}$ lb.
Eggs	3 for 11 ct.
Butter	30 ct. a pound.
Condensed Milk . .	2 cans for 18 ct.
Canned Soup . . .	3 cans for 40 ct.
Canned Peaches . .	3 cans for 90 ct.

Make 2 problems about each article, using numbers greater than 12. Solve each problem.

WRITTEN EXERCISE

1. Multiply:

\$43 by 51; \$23 by 14; \$55 by 13; \$61 by 21;
\$15 by 32.

2. Multiply:

29	44	66	81	56
<u>13</u>	<u>16</u>	<u>17</u>	<u>71</u>	<u>18</u>

3. Find the products of:

65 and 22; 32 and 35; 45 and 27; 57 and 55;
24 and 46.

4. Find the products of :

93	multiplied by	52,
81	"	" 44,
57	"	" 72,
39	"	" 64,
48	"	" 58.

5. Multiplicand	67 ct.	81 ct.	63 ct.	52 ct.	64 ct.
Multiplier	<u>49</u>	<u>37</u>	<u>65</u>	<u>32</u>	<u>24</u>
Product	?	?	?	?	?

WRITTEN PROBLEMS

- Find the cost of 40 overcoats at \$35 each.
- A hotel uses 76 lb. of meat each day. How many pounds will be used in 24 da. at that rate?
(*Prove the answer.*)
- There are 48 apples in each box. How many apples in 85 boxes?
- A train travels at the rate of 42 mi. an hour. How many miles will it travel in 36 hr.?
(*Prove the answer.*)
- A dealer buys 52 desks at \$26 each. He sells them for \$54 each. How much is his profit?

WRITTEN EXERCISE

- Multiply:
73 by 79; 128 by 13; 25 by 84; 365 by 46.

2. Multiply:

71 ct.	56 ct.	71 ct.	28 ct.	\$ 1.98
<u>83</u>	<u>22</u>	<u>72</u>	<u>44</u>	<u>35</u>

3. $36 \times 94 = ?$ $52 \times 64 = ?$ $29 \times 91 = ?$
 $938 \times 42 = ?$ $377 \times 68 = ?$ $79 \times 46 = ?$

4. Find the products of:

88	multiplied	by	92,
87	"	"	81,
33	"	"	17,
395	"	"	29,
806	"	"	84.

5. Multiplicand	68 in.	87 yd.	99 ft.	647 bu.
Multiplier	<u>26</u>	<u>38</u>	<u>92</u>	<u>38</u>
Product	?	?	?	?

WRITTEN PROBLEMS

1. A man receives a salary of \$55 a week. Find his salary for 24 wk.

2. He spends an average of \$37 a week. How much will he spend in 24 wk.?

3. At that rate of expense, how much money will he save in 24 wk.?

4. A milkman delivers 87 qt. of milk a day. How many quarts will he deliver during August, at that rate? (*Prove the answer.*)

5. A hardware dealer sells the following :

37 saws at 58 ct. each,
 28 hammers at 36 ct. each,
 16 lb. of nails at 8 ct. a pound.

Find the amount of money he received for the saws; for the hammers; for the nails. How much money was received for all the articles ?

6. Make 3 more problems from the prices given in number 5. Solve each problem.

WRITTEN EXERCISE

1. Multiply :

34 ct.	17 ct.	22 ct.	\$51	\$46
<u>39</u>	<u>57</u>	<u>36</u>	<u>89</u>	<u>21</u>

2. Multiply :

\$5.16	\$704	\$3.20	\$9.50	\$509
<u>21</u>	<u>92</u>	<u>85</u>	<u>47</u>	<u>36</u>

3. $46 \times 21 = ?$ $31 \times 58 = ?$ $33 \times 91 = ?$
 $875 \times 46 = ?$ $927 \times 83 = ?$ $709 \times 76 = ?$

4. Find the products of :

84 and 46; 54 and 78; 51 and 97; 93 and 29.

5. Find the products of :

365 and 24; 705 and 38; 641 and 42; 839 and 7;
 967 and 62.

WRITTEN PROBLEMS

1. The cost of an American flag is 85 ct. Find the cost of 75 flags at that price.

2. 16 sq. ft. of glass are used for a window. How many square feet will be used for 73 windows of the same size?

3. The fare from the city to the seashore is 46 ct. An agent sells 69 tickets. How much money does he receive? (*Prove the answer.*)

4. A boat sails 18 mi. an hour. How far does it sail in 47 hr. at that rate?

5. One train travels at the rate of 32 mi. an hour; another train at the rate of 18 mi. an hour. How much farther will the first train go in 17 hr. than the second? (*Use direct method.*)

WRITTEN EXERCISE

Multiply:

1. 85 by 16, by 32, by 48, by 64, by 80.
2. ~~376~~ by 14, by 24, by 34, by 44, by 54.
3. ~~309~~ by 27, by ~~48~~, by 69, by 36, by 25.
4. ~~908~~ by ~~11~~, by 62, by 83, by 94, by 74.

5. Multiply:

\$9.78	\$742	\$836	\$5.02	\$7.41
<u>39</u>	<u>56</u>	<u>75</u>	<u>82</u>	<u>93</u>

WRITTEN PROBLEMS

1. How much will 96 suits of clothes cost at \$26 a suit?

2. A cow gives 16 qt. of milk a day. How much milk will be obtained each day from 48 cows, at that rate? (*Prove the answer.*)

3. A cow gives 16 qt. of milk a day. How much milk will be obtained from 36 cows in 3 da., at that rate?

4. Mr. Harmon bought 37 cows at \$52 each. He sold them for \$72 each. Find his profit. (*Prove the answer.*)

5. 64 books weigh 36 lb. each. Each book is packed in a wooden box. Each box weighs 6 lb. What is the entire weight of the books and boxes?

6. Find the cost of 74 pianos at \$287 each.

7. A factory makes 48 wheels a day. How many wheels are made in 324 da. at that rate? (*Prove the answer.*)

8. 127 men were employed in a store at \$34 a week. Later the number of men was reduced to 99. How much money did the store save each week by the reduction?

DIVISION

Introduction



1. These boys are playing soldiers. Carl is the captain. Carl wants his soldiers to march in 2 equal lines. How many soldiers will he have in each line?

How many are 8 boys divided by 2?

Count by 2's to 8. How many 2's in 8?

2. If Carl wants his soldiers to march in 4 equal lines, how many soldiers will he put in each line?

How many are 8 boys divided by 4?

Count by 4's to 8. How many 4's in 8?

3. 2 soldiers go home; Carl has only 6 soldiers now. If Carl wants his soldiers to march 2 in a row, how many rows will there be?

How many are 6 divided by 3?

Count by 2's to 6. How many 2's in 6?

4. If Carl wants his 6 soldiers to march 3 in a row, how many rows will there be?

How many are 6 divided by 3?

Count by 3's to 6. How many 3's in 6?

5. William must arrange these 12 books in 2 equal piles. How many books will he put in each pile?



12 books divided by
2 = ? books.

Count by 2's to 12. How many 2's in 12?

6. William arranges the 12 books in 3 equal piles. How many books are in each pile?

12 books divided by 3 = ? books.

Count by 3's to 12. How many 3's in 12?

7. Arrange the 12 books in 4 equal piles. How many books in each pile?

12 books divided by 4 = ? books.



8. Arrange the books in 6 equal piles. How many books in each pile?

12 books divided
by 6 = ? books.

9. Arrange the 12 oranges in equal piles, putting 2 oranges in each pile. How many piles are there?

12 divided by 2 = ?

10. A room is 20 ft. long. Harry walks across the room. He takes 10 equal paces. How many feet in each pace?


$$20 \text{ divided by } 2 = ?$$

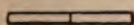
11. Make another problem like No. 10.

12. A room is 24 ft. long. A boy paces across the room. If he takes 3 ft. at each pace, how many paces are required?

$$24 \text{ divided by } 3 = ?$$

13. Make another problem like No. 12.

14. A  B



The line is 10 ft. long. My ruler is 2 ft. long. How many times shall I use the ruler in measuring the length of the line?

$$10 \text{ divided by } 2 = ?$$

The sign of division is \div .

12 divided by 3 equals 4, is written $12 \div 3 = 4$.

12 is the dividend, or the number divided.

3 is the divisor, or the number by which we divide.

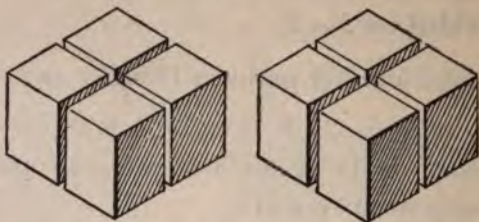
4 is the quotient, or the result.

12 \div 3 = 4, is also written $\begin{array}{r} 3 \overline{)12} \\ 4 \end{array}$ and $\frac{12}{3}$.

*Cross References: Introduction to Multiplication, page 54.
Introduction to Fractions, page 159.*

DIVISION TABLES

Division Table of Twos



1. Make 2 piles of blocks. Put 4 blocks in each pile. How many blocks are there?

2. Now take 8 blocks. Arrange them in 2 equal piles. How many blocks are in each pile?

1ST EXAMPLE

$$2 \times 4 \text{ blocks} = 8 \text{ blocks.}$$

2D EXAMPLE*

$$8 \text{ blocks} \div 2 = 4 \text{ blocks.}$$

Count by 2's to 8. How many 2's in 8?

3. There are 3 ft. in 1 yd. How many feet in 2 yd.?

4. How many yards are there in 6 ft.?

3D EXAMPLE

$$2 \times 3 \text{ ft.} = 6 \text{ ft.}$$

4TH EXAMPLE

$$6 \div 2 = 3.$$

Count by 2's to 6. How many 2's make 6?

5. A drawing pencil costs 5 ct. How much will 2 pencils cost?

6. How many pencils may I buy for 10 ct. if each pencil costs 5 ct.?

Division Table of Twos

Memorize this table :

$2 \div 2 = 1$	$\begin{array}{r} 2 \overline{)2} \\ 1 \end{array}$	$14 \div 2 = 7$	$\begin{array}{r} 2 \overline{)14} \\ 7 \end{array}$
$4 \div 2 = 2$	$\begin{array}{r} 2 \overline{)4} \\ 2 \end{array}$	$16 \div 2 = 8$	$\begin{array}{r} 2 \overline{)16} \\ 8 \end{array}$
$6 \div 2 = 3$	$\begin{array}{r} 2 \overline{)6} \\ 3 \end{array}$	$18 \div 2 = 9$	$\begin{array}{r} 2 \overline{)18} \\ 9 \end{array}$
$8 \div 2 = 4$	$\begin{array}{r} 2 \overline{)8} \\ 4 \end{array}$	$20 \div 2 = 10$	$\begin{array}{r} 2 \overline{)20} \\ 10 \end{array}$
$10 \div 2 = 5$	$\begin{array}{r} 2 \overline{)10} \\ 5 \end{array}$	$22 \div 2 = 11$	$\begin{array}{r} 2 \overline{)22} \\ 11 \end{array}$
$12 \div 2 = 6$	$\begin{array}{r} 2 \overline{)12} \\ 6 \end{array}$	$24 \div 2 = 12$	$\begin{array}{r} 2 \overline{)24} \\ 12 \end{array}$

NOTE TO TEACHER. — There are two types of problems in division.
 (a) To find the number of equal groups when the total number of units and the number of units in each group are given ; *e.g.* "Arrange 12 oranges in equal piles, putting 2 oranges in each pile ; how many piles?" (b) To find the number of units in one group when the total number of units and the number of equal groups are given ; *e.g.* "Arrange 12 oranges in 6 equal piles ; how many oranges in each pile?"

The teacher should correlate these 2 types of problems, but the pupil should not be required to make the distinction between them.

Base the development of the steps of the division tables upon the corresponding steps of the multiplication tables. When pupils make mistakes in giving the steps of the division tables, deduce the results from the corresponding steps of the multiplication tables, or from the nearest known step of the division tables. The importance of daily drills to fix the combinations is as great here as in the other fundamental operations. Read note on page 57.

ORAL EXERCISE

Application — 2 Table

1. George divided 8 marbles into 2 equal piles. How many marbles in each pile?

2. Florence bought 2 pencils for 6 ct. How much does 1 pencil cost at that rate?

3. Harry drew a line 1 ft. in length. He divided it into 2 equal parts. How many inches in each part?

4. One basket weighs twice as much as another. The heavier basket weighs 22 lb. What is the weight of the lighter basket?

5. How many 2-ct. stamps should I get for 18 ct.?

6. A number of boys had 16 ct. Each boy had 2 ct. How many boys were there?

7. Which is greater, $12 \div 2$ or $8 \div 2$? How much?

8. 4 pencils cost 8 ct. 2 pencils cost ?

METHOD. 2 pencils will cost $\frac{1}{2}$ as much as 4 pencils.

9. Harry bought 6 pears at 2 ct. each. How much did he pay for them?

10. Make 2 division problems from No. 9. Solve each problem.

11. $40 \div 2 = 20$. How much is $38 \div 2$? $36 \div 2$? Give a reason for each answer.

Cross References: *Multiplication Table of Twos*, page 56.

One half of Odd and Even Numbers, pages 177 and 180.

Division Table of Threes

1. Count by 3's to 6. How many 3's in 6?
 Count by 3's to 9. How many 3's in 9?
 Count by 3's to 12. How many 3's in 12?
2. I have 15 penholders. I arrange them in 3 equal groups. How many penholders are in each group?
 $15 \text{ penholders} \div 3 = ?$



3. I have 15 penholders. I arrange them in groups. Each group contains 3 penholders. How many groups are there?

$$15 \text{ penholders} \div 3 \text{ penholders} = ?$$

4. 3 blank books cost 27 ct. How much will 1 blank book cost?

$$27 \text{ ct.} \div 3 = ?$$

A^{5.} _____ B

C ——— D

AB represents a line 21 in. in length; CD represents a line 3 in. in length. The length of AB is how many times the length of CD ?

$$21 \div 3 = ?$$

6. Read and answer the following questions :

MULTIPLICATION

$3 \times 1 = ?$

$3 \times 2 = ?$

$3 \times 3 = ?$

$3 \times 4 = ?$

$3 \times 5 = ?$

$3 \times 6 = ?$

DIVISION

How much is $3 \div 3$?“ “ “ $6 \div 3$?“ “ “ $9 \div 3$?“ “ “ $12 \div 3$?“ “ “ $15 \div 3$? ,“ “ “ $18 \div 3$?

7. Complete the division table of threes.

Division Table of Threes

Memorize this table :

$3 \div 3 = 1$	$\begin{array}{r} 3 \overline{)3} \\ 1 \end{array}$	$21 \div 3 = 7$	$\begin{array}{r} 3 \overline{)21} \\ 7 \end{array}$
$6 \div 3 = 2$	$\begin{array}{r} 3 \overline{)6} \\ 2 \end{array}$	$24 \div 3 = 8$	$\begin{array}{r} 3 \overline{)24} \\ 8 \end{array}$
$9 \div 3 = 3$	$\begin{array}{r} 3 \overline{)9} \\ 3 \end{array}$	$27 \div 3 = 9$	$\begin{array}{r} 3 \overline{)27} \\ 9 \end{array}$
$12 \div 3 = 4$	$\begin{array}{r} 3 \overline{)12} \\ 4 \end{array}$	$30 \div 3 = 10$	$\begin{array}{r} 3 \overline{)30} \\ 10 \end{array}$
$15 \div 3 = 5$	$\begin{array}{r} 3 \overline{)15} \\ 5 \end{array}$	$33 \div 3 = 11$	$\begin{array}{r} 3 \overline{)33} \\ 11 \end{array}$
$18 \div 3 = 6$	$\begin{array}{r} 3 \overline{)18} \\ 6 \end{array}$	$36 \div 3 = 12$	$\begin{array}{r} 3 \overline{)36} \\ 12 \end{array}$

You have learned that $3 \times 2 = 6$.The numbers 3 and 2 are *factors* of 6.

The number 6 is a multiple of 3 and of 2.

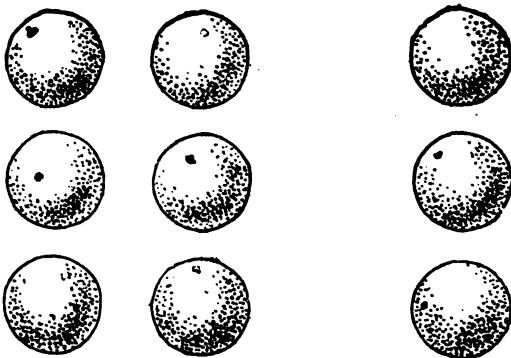
1. Tell the factors of 12; of 21; of 30; of 36.
2. 9 is a multiple of ? 18 is a multiple of ? 24 is a multiple of ?
3. Tell a multiple of 2; of 8; of 3; of 9.

ORAL EXERCISE

Application — 3 Table

1. Mary spent 24 ct. for 3 loaves of bread. How much does 1 loaf cost?
2. A girl earns \$30 for working 10 wk. How much does she earn in 1 wk.?
3. One line is 3 times as long as another. The longer line is 18 ft. long. How long is the shorter line?
4. A girl saves an equal amount of money each day. At the end of 12 da. she has saved 36 ct. How much money does she save each day?
5. John has 24 marbles. Tom has only 3 marbles. John's marbles are how many times Tom's marbles?
6. There are 30 horses in a circus. They are arranged 3 in a group. How many groups are there?
7. How much greater is $15 \div 3$ than $9 \div 3$?

8.



6 oranges cost 10 ct. 3 oranges cost ?
Why?

9. 6 books cost 8 ct. How much do 3 books cost? Why?

10. 9 pencils cost 12 ct. How much do 3 pencils cost? Why?

*Cross References : Multiplication Table of Threes, page 58.
One Third of Numbers, page 182.*

Division Table of Fours

1. Count by 4's to 8. How many 4's in 8?
Count by 4's to 16. How many 4's in 16?
Count by 4's to 28. How many 4's in 28?

By counting tell how many 4's in 12, in 24, in 20, in 40, in 32, in 36, in 48.

2. Complete the division table of fours.

Division Table of Fours

Memorize this table :

$4 \div 4 = 1$	$20 \div 4 = 5$	$36 \div 4 = 9$
$8 \div 4 = 2$	$24 \div 4 = 6$	$40 \div 4 = 10$
$12 \div 4 = 3$	$28 \div 4 = 7$	$44 \div 4 = 11$
$16 \div 4 = 4$	$32 \div 4 = 8$	$48 \div 4 = 12$

ORAL EXERCISE

1. Tell the factors of 12; of 20; of 24; of 36.
2. 8 is a multiple of ? 20 is a multiple of ? 24 is a multiple of ? 40 is a multiple of ?
3. Tell a multiple of 4; of 3; of 5; of 7.

ORAL EXERCISE**Application — 4 Table**

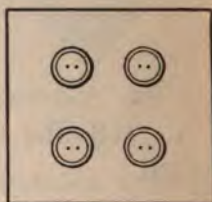
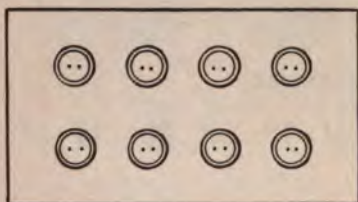
1. If a gallon of molasses costs 28 ct., how much does a quart cost?
2. A line 32 ft. long is divided into 4 equal parts. How many feet in each part?
3. One apple tree yields 4 times as many apples as another tree. The first tree yields 16 bu. How many bushels does the second tree yield?

4. A farmer sells 44 qt. of berries. The berries are packed in 4 boxes of equal size. How many quarts are there in each box?

5. There are 48 men in a parade. They march 4 in a row. How many rows are there?

6. How much greater is $12 \div 4$ than $8 \div 4$?

7.



8 buttons cost 10 ct. 4 buttons cost? Why?

8. 12 chairs cost \$15. How much do 4 chairs cost?

9. The first year a man raised 12 bu. of potatoes. The second year he raised 4 times as many. How many bushels of potatoes did he raise the second year?

10. Make a division example from No. 9. Solve it.

11. $52 \div 4 = 13$. How much is $56 \div 4$? $60 \div 4$? $64 \div 4$? Give a reason for each answer.

*Cross References: Multiplication Table of Fours, page 61.
One Fourth of Numbers, page 184.*

Division Table of Fives

1. Write the Multiplication Table of Fives. Then write the steps of the Division Table of Fives in this way.

MULTIPLICATION TABLE OF FIVES

$$5 \times 1 = 5$$

$$5 \times 2 = 10$$

$$5 \times 3 = 15$$

DIVISION TABLE OF FIVES

$$5 \div 5 = 1$$

$$10 \div 5 = 2$$

$$15 \div 5 = 3$$

Division Table of Fives

Memorize this table :

$$5 \div 5 = 1$$

$$25 \div 5 = 5$$

$$45 \div 5 = 9$$

$$10 \div 5 = 2$$

$$30 \div 5 = 6$$

$$50 \div 5 = 10$$

$$15 \div 5 = 3$$

$$35 \div 5 = 7$$

$$55 \div 5 = 11$$

$$20 \div 5 = 4$$

$$40 \div 5 = 8$$

$$60 \div 5 = 12$$

ORAL EXERCISE**Application — 5 Table**

1. Divide 15 ct. equally among 5 children. •
How much money does each child receive?
2. A grocer had 30 cans of soup. He arranges them in groups of 5. How many groups?
3. A line 25 in. long is composed of 5 equal parts. How many inches in each part?

4. A package of morning glory seeds costs 5 ct. How many packages may I buy for 30 ct.?

5. How much less is $15 \div 5$ than $40 \div 5$?

6. 10 bottles of mucilage cost 60 ct. How much will 2 bottles cost? Why?

7. 2 oranges cost 5 ct. How many oranges can I buy for 15 ct.? Why?

8. 2 oranges cost 5 ct. How much do 10 oranges cost at that rate? Why?

9. Tell the factors of 15; of 25; of 45; of 60.

10. Tell a multiple of 2; of 5; of 6; of 3; of 8.

*Cross References: Multiplication Table of Fives, page 64.
One Fifth of Numbers, page 184.*

Division Table of Sixes

Write the Multiplication Table of Sixes. Then write the steps of the Division Table of Sixes in this way.

MULTIPLICATION TABLE OF SIXES

$$6 \times 1 = 6$$

$$6 \times 2 = 12$$

$$6 \times 3 = 18$$

$$6 \times 4 = 24$$

DIVISION TABLE OF SIXES

$$6 \div 6 = 1$$

$$12 \div 6 = 2$$

$$18 \div 6 = 3$$

$$24 \div 6 = 4$$

Division Table of Sixes

Memorize this table :

$6 \div 6 = 1$	$30 \div 6 = 5$	$54 \div 6 = 9$
$12 \div 6 = 2$	$36 \div 6 = 6$	$60 \div 6 = 10$
$18 \div 6 = 3$	$42 \div 6 = 7$	$66 \div 6 = 11$
$24 \div 6 = 4$	$48 \div 6 = 8$	$72 \div 6 = 12$

ORAL EXERCISE**Application — 6 Table**

1. A boy rows a boat for 18 mi. He rows 6 mi. an hour. How many hours does it take to row the entire distance ?
2. At \$6 each, how many chairs may I buy for \$60 ? For \$72 ?
3. If I buy 6 sleighs for \$12, how much does 1 sleigh cost ? 3 sleighs ?
4. A flagstaff is 24 ft. high. A man who stands near it is 6 ft. tall. The height of the flagstaff is how many times the height of the man ?
5. If you had 54 ct., could you buy 9 hoops at 6 ct. each ? Give a reason for your answer.
6. The wall of a room is 36 ft. wide. How many strips of paper each 6 ft. wide are needed for the wall ?

Cross References : Multiplication Table of Sixes, page 66.

Division Tables of Sevens, Eights, Nines, and Tens

Construct the Division Tables of Sevens, Eights, Nines, and Tens in the way you were taught on page 116.

Division Table of Sevens

Memorize this table:

$7 \div 7 = 1$	$35 \div 7 = 5$	$63 \div 7 = 9$
$14 \div 7 = 2$	$42 \div 7 = 6$	$70 \div 7 = 10$
$21 \div 7 = 3$	$49 \div 7 = 7$	$77 \div 7 = 11$
$28 \div 7 = 4$	$56 \div 7 = 8$	$84 \div 7 = 12$

Division Table of Eights

Memorize this table:

$8 \div 8 = 1$	$40 \div 8 = 5$	$72 \div 8 = 9$
$16 \div 8 = 2$	$48 \div 8 = 6$	$80 \div 8 = 10$
$24 \div 8 = 3$	$56 \div 8 = 7$	$88 \div 8 = 11$
$32 \div 8 = 4$	$64 \div 8 = 8$	$96 \div 8 = 12$

Division Table of Nines

Memorize this table:

$9 \div 9 = 1$	$45 \div 9 = 5$	$81 \div 9 = 9$
$18 \div 9 = 2$	$54 \div 9 = 6$	$90 \div 9 = 10$
$27 \div 9 = 3$	$63 \div 9 = 7$	$99 \div 9 = 11$
$36 \div 9 = 4$	$72 \div 9 = 8$	$108 \div 9 = 12$

Division Table of Tens

Memorize this table:

$10 \div 10 = 1$	$50 \div 10 = 5$	$90 \div 10 = 9$
$20 \div 10 = 2$	$60 \div 10 = 6$	$100 \div 10 = 10$
$30 \div 10 = 3$	$70 \div 10 = 7$	$110 \div 10 = 11$
$40 \div 10 = 4$	$80 \div 10 = 8$	$120 \div 10 = 12$

ORAL EXERCISE

Application—Tables 7, 8, 9, 10

1. $\boxed{4}$ oranges cost 7 ct. $\boxed{}$ How many oranges may I buy for 28 ct.? Why?

2. 4 oranges cost 7 ct. How much will 28 oranges cost? Why?

3. A grocer pours 64 lb. of sugar into 8 boxes. The boxes contain equal quantities. How many pounds in each box?

4. There are two tanks on the roof of a house. One tank holds 8 times as much water as the other tank. If the larger tank holds 56 gal., how many gallons does the smaller tank hold?

5. If 84 eggs are put into 12 boxes of equal size, how many eggs are in each box?

6. I have 80 ct. Is that enough to buy 10 packages of pins at 8 ct. a package? Give a reason for your answer.

7. 3 bananas cost 8 ct. How much will 24 bananas cost? Why?

8. 3 bananas cost 8 ct. How many bananas can I buy for 24 ct.? Why?

9. How much less is $16 \div 8$ than $24 \div 8$? Why?

10. Tell 3 multiples of 3, of 8, of 4, of 6.
11. Tell the greatest factor of 6, of 8, of 10 of 4.
12. Tell a factor of *both* 4 and 8; of 6 and 9; of 8 and 12; of 14 and 21.

A number which is a factor of two or more numbers is called a common factor of those numbers. 2 is a common factor of 4 and 8; 2 is not a common factor of 4 and 9.

13. Divide a line 54 in. long into 9 equal parts. How long is each part?

14. 108 buttons are placed on 9 cards. Each card contains the same number of buttons. How many buttons on each card?

15. On Monday a dealer sells 9 times as many pairs of shoes as he sells on Tuesday. If he sells 72 pairs on Monday, how many does he sell on Tuesday?

16. $27 \div 9 = ?$ How much are $27 \div 3$? Why?
17. How much greater is $45 \div 9$ than $36 \div 9$? Why?
18. How much less is $18 \div 9$ than $36 \div 9$? Why?
19. What number is a multiple of both 3 and 6; of both 2 and 8; of both 9 and 12.

20. Write a list of 4 articles each of which costs **10** ct. Make 2 division problems about each article. Solve each problem.

21. One pole is 100 ft. high. Another pole is **10** ft. high. Complete the problem and solve it.

22. A girl receives \$40 for working for 4 wk. Complete the problem and solve it.

23. How much greater is $80 \div 10$ than $60 \div 10$? Why?

24. 3 oranges cost 10 ct. How many oranges may I buy for 50 ct.? Why?

25. 3 oranges cost 10 ct. How much do 30 oranges cost? Why?

26. What number is a factor of both 20 and 30; of both 15 and 25; of both 6 and 30.

27. What number is a multiple of both 3 and 10; of both 4 and 6; of both 7 and 12.

When a number is a multiple of two or more numbers, it is called a common multiple of those numbers. 30 is a common multiple of 10 and 3.

Cross References:

<i>Multiplication Table of Sevens,</i> page 68.	<i>Multiplication Table of Nines,</i> page 68.
<i>Multiplication Table of Eights,</i> page 68.	<i>Multiplication Table of Tens,</i> page 68.
<i>One Eighth of Numbers,</i> page 198.	<i>Division by 10,</i> page 145.

Division Tables of Elevens and Twelves

Construct the Division Tables of Elevens and Twelves.

Division Table of Elevens

Memorize this table:

$11 \div 11 = 1$	$55 \div 11 = 5$	$99 \div 11 = 9$
$22 \div 11 = 2$	$66 \div 11 = 6$	$110 \div 11 = 10$
$33 \div 11 = 3$	$77 \div 11 = 7$	$121 \div 11 = 11$
$44 \div 11 = 4$	$88 \div 11 = 8$	$132 \div 11 = 12$

Division Table of Twelves

Memorize this table:

$12 \div 12 = 1$	$60 \div 12 = 5$	$108 \div 12 = 9$
$24 \div 12 = 2$	$72 \div 12 = 6$	$120 \div 12 = 10$
$36 \div 12 = 3$	$84 \div 12 = 7$	$132 \div 12 = 11$
$48 \div 12 = 4$	$96 \div 12 = 8$	$144 \div 12 = 12$

ORAL EXERCISE**Application — 11 Table**

1. Fill the blank spaces and solve the problems:
11 yd. of calico cost ——. How much does 1 yd. cost?
11 yd. of muslin cost ——. How much does 1 yd. cost?
2. Fill in the blank spaces and solve the problems:
11 eggs cost ——. How much does 1 egg cost?
11 lb. of crackers cost ——. How much does 1 lb. of crackers cost?

3. 2 spools of cotton cost 11 ct. How many spools can I buy for 66 ct.? Why?

4. 2 spools of cotton cost 11 ct. Find the cost of 22 spools. Give a reason for your answer.

5. A tree is 48 ft. high. This is 12 times as high as a bush near it. How high is the bush?

6. One farmer raises 108 boxes of berries. Another farmer raises only one twelfth as many. How many boxes are raised by the second farmer?

7. A dealer sells 12 times as many toy drums as toy pistols. If he sells 144 drums, how many pistols does he sell?

Cross References: Multiplication Table of Elevens, page 71.

Multiplication Table of Twelves, page 72. '

Review of Division Tables through 12

Oral Drills on the Division Tables

ORAL DRILL

Begin at the left. Divide each number by the number on the left-hand side. Tell the quotients at once.

1. $\underline{6)12, 66, 36, 60, 6, 18, 30, 42, 54, 48, 24.}$

2. $\underline{8)24, 72, 88, 24, 48, 64, 96, 80, 56, 16, 40, 8.}$

3. $\underline{12)36, 60, 96, 72, 132, 24, 144, 108, 84, 120, 48, 12.}$

ORAL DRILL

Divide each number by the number in the rectangle. Tell the quotients instantly.

8	12	6
16	2	24
20	14	18
12	28	40
20	4	8
48	86	24

40	20	45
5	5	60
25	80	55
20	70	80
40	10	50
60	80	90

ORAL DRILL

"The Ladder"

32
80
40
28
32
88
48
24
16
72
96
8
÷ 8

1. Begin at the lowest number; go up as quickly as possible. Tell the quotients.

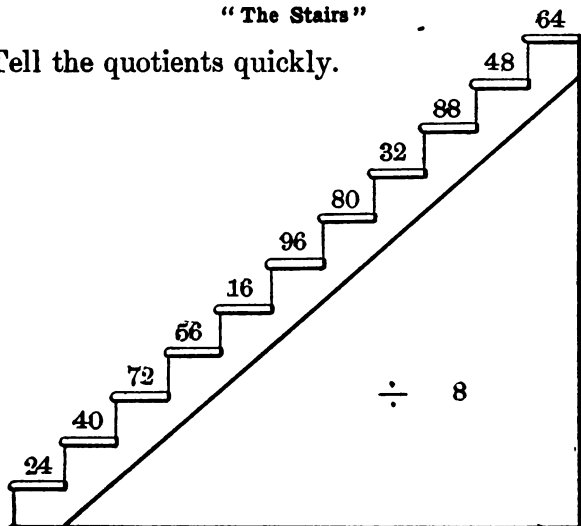
2. Begin at the highest number; go down as quickly as possible. Tell the quotients.

3. Begin at the middle and skip around.

4. Make other ladders, writing your own dividends.

"The Stairs"

Tell the quotients quickly.

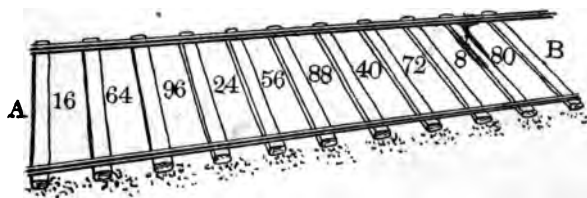


ORAL DRILL

'Railroad Ties'

Go from *A* to *B* as quickly as possible, then back from *B* to *A*.

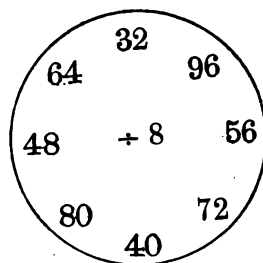
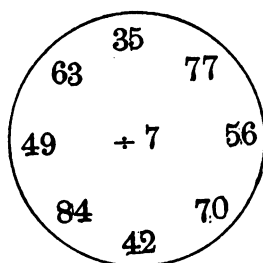
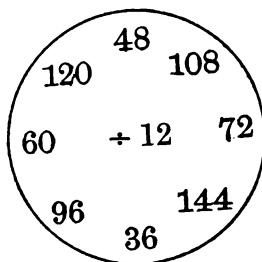
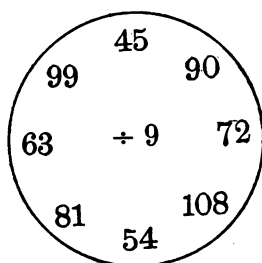
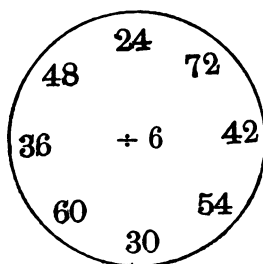
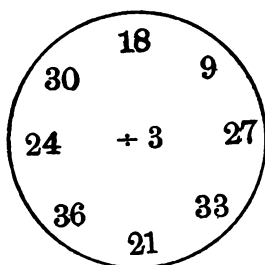
Divide by 2, by 4, by 8.



DIVISION

ORAL DRILL

"The Circle"



ORAL DRILL

Find the missing numbers (factors):

- | | |
|------------------------|------------------------|
| 1. $12 \div * = 4.$ | 26. $77 \div * = 11.$ |
| 2. $12 \div * = 2.$ | 27. $49 \div * = 7.$ |
| 3. $12 \div * = 3.$ | 28. $35 \div * = 5.$ |
| 4. $12 \div * = 1.$ | 29. $96 \div * = 8.$ |
| 5. $36 \div * = 6.$ | 30. $60 \div * = 10.$ |
| 6. $36 \div * = 3.$ | 31. $108 \div * = 12.$ |
| 7. $36 \div * = 4.$ | 32. $72 \div * = 6.$ |
| 8. $36 \div * = 9.$ | 33. $66 \div * = 6.$ |
| 9. $70 \div * = 7.$ | 34. $12 \div * = 3.$ |
| 10. $88 \div * = 11.$ | 35. $24 \div * = 12.$ |
| 11. $90 \div * = 9.$ | 36. $24 \div * = 4.$ |
| 12. $96 \div * = 12.$ | 37. $24 \div * = 8.$ |
| 13. $108 \div * = 9.$ | 38. $24 \div * = 6.$ |
| 14. $72 \div * = 12.$ | 39. $24 \div * = 2.$ |
| 15. $33 \div * = 11.$ | 40. $48 \div * = 4.$ |
| 16. $144 \div * = 12.$ | 41. $48 \div * = 6.$ |
| 17. $30 \div * = 6.$ | 42. $48 \div * = 8.$ |
| 18. $56 \div * = 8.$ | 43. $4 \div * = 2.$ |
| 19. $64 \div * = 8.$ | 44. $10 \div * = 5.$ |
| 20. $40 \div * = 8.$ | 45. $32 \div * = 8.$ |
| 21. $16 \div * = 8.$ | 46. $14 \div * = 2.$ |
| 22. $18 \div * = 6.$ | 47. $15 \div * = 5.$ |
| 23. $120 \div * = 12.$ | 48. $20 \div * = 4.$ |
| 24. $132 \div * = 11.$ | 49. $100 \div * = 10.$ |
| 25. $66 \div * = 11.$ | 50. $110 \div * = 11.$ |

ORAL DRILL

Tell the missing numbers (multiples):

- | | | |
|---------------------|---------------------|---------------------|
| 1. $* \div 4 = 12.$ | 2. $* \div 6 = 10.$ | 3. $* \div 8 = 12.$ |
| $* \div 4 = 7.$ | $* \div 6 = 7.$ | $* \div 8 = 7.$ |
| $* \div 4 = 10.$ | $* \div 6 = 6.$ | $* \div 8 = 8.$ |
| $* \div 4 = 9.$ | $* \div 6 = 8.$ | $* \div 8 = 3.$ |
| $* \div 4 = 11.$ | $* \div 6 = 12.$ | $* \div 8 = 9.$ |
| $* \div 4 = 6.$ | $* \div 6 = 9.$ | $* \div 8 = 5.$ |
| 4. $* \div 7 = 12.$ | 5. $* \div 3 = 12.$ | 6. $* \div 5 = 4.$ |
| $* \div 7 = 8.$ | $* \div 3 = 6.$ | $* \div 5 = 6.$ |
| $* \div 7 = 9.$ | $* \div 3 = 9.$ | $* \div 5 = 9.$ |
| $* \div 7 = 7.$ | $* \div 3 = 8.$ | $* \div 5 = 7.$ |
| $* \div 7 = 4.$ | $* \div 3 = 7.$ | $* \div 5 = 5.$ |
| $* \div 7 = 10.$ | $* \div 3 = 10.$ | $* \div 5 = 8.$ |
| 7. $* \div 9 = 9.$ | 8. $* \div 11 = 4.$ | 9. $* \div 12 = 8.$ |
| $* \div 9 = 5.$ | $* \div 11 = 9.$ | $* \div 12 = 11.$ |
| $* \div 9 = 10.$ | $* \div 11 = 7.$ | $* \div 12 = 4.$ |
| $* \div 9 = 7.$ | $* \div 11 = 3.$ | $* \div 12 = 9.$ |
| $* \div 9 = 6.$ | $* \div 11 = 10.$ | $* \div 12 = 7.$ |
| $* \div 9 = 4.$ | $* \div 11 = 6.$ | $* \div 12 = 3.$ |

REVIEW OF DIVISION TABLES—PROBLEMS

1. Divide 18 tops into 3 equal groups. How many in each group?
2. Divide 36 marbles equally among 12 boys. How many marbles for each boy?

3. A father divided \$24 equally among his 4 children. How much did each child receive?

4. I pour 16 pt. of milk into glasses. Each glass holds 1 qt. How many glasses are needed?

5. A grocer poured 24 qt. of molasses into gallon jars. How many jars were needed?

6. How many feet in 24 in.? In 36 in.? In 60 in.?

7. How many yards in 27 ft.? In 36 ft.? In 48 ft.?

8. The wall of a room is 60 ft. long. How many strips of paper 3 ft. wide are needed to cover the wall?

9. A fence 50 ft. long is divided into 5 equal parts. How many feet in each part?

10. A ball team plays 4 games each week. How long before 24 games are played?

11. How many dollars in 48 quarter dollars?

12. A machine makes 27 screws at the rate of 3 a minute. How many minutes does it take to make 54 screws? 42 screws?

13. How many yards in 15 ft.? In 21 ft.? In 36 ft.?

14. How many bushels in 24 pk.? In 32 pk.?

15. How many nickels in 50 ct.?

16. 75 ct. will pay for how many 5-ct. stamps?

17. We solve 5 examples every day. How many days will it take to solve 60 examples?

18. A girl hems 5 napkins in a week. How long will it take her to hem 30 napkins at that rate?

19. How many gallons in 80 qt.? In 120 qt.?

20. Our teacher placed 48 readers in 6 equal piles. How many readers were there in each pile?

DIVISION

Divisors of One Order. No Carrying. No Remainders.

A. Divide 68 pencils into 2 equal groups. How many pencils in each group?

EXPLANATION OR FORM OF ANALYSIS. The number of pencils in each group will be $\frac{1}{2}$ of 68, or $68 \div 2$.

$$\begin{array}{r|l} 2 \overline{)68} = 2 \overline{)6 \text{ tens} + 8 \text{ units}} & \begin{array}{l} 6 \text{ tens} \div 2 = 3 \text{ tens} \\ 8 \text{ units} \div 2 = 4 \text{ units} \\ \hline 68 \div 2 = 34 \text{ Ans.} \end{array} \\ \quad \quad \quad 3 \text{ tens} + 4 \text{ units} & \end{array}$$

A short way is

$$\begin{array}{r|l} 2 \overline{)68} & \begin{array}{l} 6 \text{ tens} \div 2 = 3 \text{ tens} \\ 8 \text{ units} \div 2 = 4 \text{ units} \\ \hline 68 \div 2 = 34 \text{ Ans.} \end{array} \\ \quad \quad 34 & \end{array}$$

(Say "6 divided by 2 equals 3; 8 divided by 2 equals 4.")

B. I put 484 qt. of berries into baskets. Each basket holds 4 qt. How many baskets are needed?

EXPLANATION OR FORM OF ANALYSIS. I shall need as many baskets as there are 4's in 484. Therefore, the number of baskets will be $484 \div 4$, or $4 \overline{)484}$.

$$\begin{array}{r} 4 \overline{)484} \\ 121 \end{array}$$

4 hundreds	$\div 4 = 1$	hundred
8 tens	$\div 4 = 2$	tens
4 units	$\div 4 = 1$	unit
<hr/>		
$484 \div 4 = 121$		
121 baskets <i>Ans.</i>		

Proof in Division

Compare these examples:

$2 \times 34 = 68$

$68 \div 2 = 34$

$3 \times 32 = 96$

$96 \div 3 = 32$

$4 \times 121 = 484$

$484 \div 4 = 121$

To prove an example in division, multiply the quotient by the divisor. If the product is the same as the dividend, the work is correct.

C. A man divided \$5.55 equally among 5 children. How much money was given to each child?

EXPLANATION OR FORM OF ANALYSIS. Each child receives $\frac{1}{5}$ of \$5.55. Therefore, the amount received by each child will be $5 \overline{)\$5.55}$.

$$\begin{array}{r} 5 \overline{)\$5.55} \\ \$1.11 \end{array}$$

Begin at the left.

Divide as in preceding examples.

Place the decimal point in the quotient directly below the decimal point in the dividend.

Cross References: Multiplier of One Order, page 80.

Fractional Parts of Numbers, pages 175-199.

ORAL EXERCISE

1. Divide 44 by 4; 88 by 4; 88 by 8; 63 by 3; 96 by 3.

2. Find the quotient of:

$25 \div 5$; $55 \div 5$; $48 \div 4$; $99 \div 3$; $66 \div 3$.

3. 22 pencils $\div 2 = ?$ 96 marbles $\div 3 = ?$

36 yd. $\div 3 = ?$

4. Find quotients:

4)48 horses

6)66 ct.

3)39 ct.

5)\$55

2)84 qt.

2)68 in.

5. Find quotients:

3)363 bu.

2)482 lb.

4)\$488

5)\$555

6)\$6.66

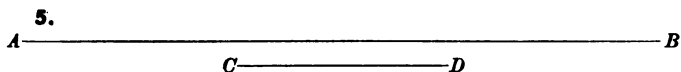
ORAL PROBLEMS

1. Divide 22 boxes into 2 equal groups. How many boxes in each group?

2. Divide 84 ct. equally among 4 girls. How much money does each girl receive?

3. 4 lb. of meat cost 88 ct. How much does 1 lb. cost?

4. A boy spends 63 ct. for cake. At 9 ct. a pound, how many pounds does he buy?



The distance from A to B is 39 mi. The distance from C to D is one third as great. What is the distance from C to D ?

WRITTEN EXERCISE

1. Divide: 264 by 2; 396 by 3; 684 by 2; 804 by 4; 240 by 2.

2. Find the quotients:

$$\begin{array}{r} 2 \overline{) \$ 648} \end{array}$$

$$\begin{array}{r} 2 \overline{) \$ 8.26} \end{array}$$

$$\begin{array}{r} 3 \overline{) \$ 9.69} \end{array}$$

$$\begin{array}{r} 4 \overline{) \$ 848} \end{array}$$

$$\begin{array}{r} 3 \overline{) \$ 6.36} \end{array}$$

3. $444 \div 2 = ?$

$444 \div 4 = ?$

$633 \div 3 = ?$

$639 \div 3 = ?$

$820 \div 2 = ?$

$740 \div 4 = ?$

4. How many times does 264 contain 2?

" " " " $933 \div 3 = ?$

" " " " $840 \div 4 = ?$

" " " " $309 \div 3 = ?$

" " " " $602 \div 2 = ?$

5. Dividend 604 qt. 408 in. \$5.50 \$606 \$8.20

Divisor	$\begin{array}{r} 2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \hline \end{array}$
---------	--	--	--	--	--

Quotient	$\begin{array}{r} ? \\ \hline \end{array}$	$\begin{array}{r} ? \\ \hline \end{array}$	$\begin{array}{r} ? \\ \hline \end{array}$	$\begin{array}{r} ? \\ \hline \end{array}$	$\begin{array}{r} ? \\ \hline \end{array}$
----------	--	--	--	--	--

WRITTEN PROBLEMS

1. A storekeeper spends \$360 in 3 mo. for rent. How much rent does he pay each month?

2. 3 books cost \$ 3.30. Find the cost of 1 book.
3. A factory makes 480 suits in 4 da. How many suits does it make each day?
4. The height of a church is twice the height of a house. The church is 220 ft. high. How high is the house?

Divisors of One Order. Carrying. No Remainders

A. Divide 164 by 2.

$$\begin{array}{r} 2 \overline{)164} = \quad \quad \quad \begin{array}{r} 1 \\ 2 \overline{)1 \text{ hundred} + 6 \text{ tens} + 4 \text{ units}} \\ \hline 0 \text{ hundred} + 8 \text{ tens} + 2 \text{ units} = 82 \end{array} \end{array}$$

Arrange the
work in this
way:

$$\begin{array}{r} 2 \overline{)164} \\ 82 \end{array}$$

Begin at the left.

1 hundred cannot be divided by 2 —
1 hundred + 6 tens = 16 tens.
16 tens ÷ 2 = 8 tens
4 units ÷ 2 = 2 units

164 ÷ 2 = 82 units *Ans.*

B. Divide 327 by 3.

$$\begin{array}{r} 3 \overline{)327} = \quad \quad \quad \begin{array}{r} 2 \\ 3 \overline{)3 \text{ hundreds} + 2 \text{ tens} + 7 \text{ units}} \\ \hline 1 \text{ hundred} + 0 \text{ tens} + 9 \text{ units} \end{array} \end{array}$$

Begin at the left.

3 hundreds ÷ 3 = 1 hundred.

2 tens cannot be divided by 3. Write 0 in the quotient in tens' place.

2 tens + 7 units = 27 units.

27 units ÷ 3 = 9 units. 109 *Ans.*

Arrange the work in this form:
$$\begin{array}{r} 2 \\ 3 \overline{) 327} \\ 109 \end{array}$$

C. Divide 8,001 by 3.

$$\begin{array}{r} 2 \qquad \qquad 2 \qquad \qquad 2 \\ 3 \overline{) 8 \text{ thousands} + 0 \text{ hundreds} + 0 \text{ tens} + 1 \text{ unit}} \\ 2 \text{ thousands} + 6 \text{ hundreds} + 6 \text{ tens} + 7 \text{ units} \end{array}$$

Begin at the left.

8 thousands $\div 3 = 2$ thousands and 2 thousands over;
 put down 2 and carry 2; 2 thousands = 20 hundreds;
 20 hundreds $\div 3 = 6$ hundreds and 2 hundreds over;
 put down 6 and carry 2; 2 hundreds = 20 tens; 20
 tens $\div 3 = 6$ tens and 2 tens over; put down 6 and
 carry 2; 2 tens = 20 units; 20 units + 1 unit = 21
 units; 21 units $\div 3 = 7$ units. 2,667 *Ans.*

Arrange the work in this form:
$$\begin{array}{r} 3 \overline{) 82021} \\ 2667 \end{array}$$

ORAL EXERCISE

1. Divide: 204 by 2; 309 by 3; 408 by 4; 505 by 5.

2. Divide: 142 books by 2; \$213 by 3; \$1.68 by 2; 153 sq. ft. by 3; 189 qt. by 3.

3. Dividend	208	168	122	123	186
Divisor	$\frac{4}{?}$	$\frac{4}{?}$	$\frac{2}{?}$	$\frac{3}{?}$	$\frac{3}{?}$
Quotient					

4. Find quotients:

$$\$182 \div 2.$$

$$\$2.46 \div 3.$$

$$\$1.04 \div 2.$$

$$\$1.26 \div 2.$$

$$\$1.28 \div 4.$$

$$\$7.50 \div 3.$$

5. How many times does 159 contain 3 ?
 “ “ “ “ 216 “ 3 ?
 “ “ “ “ 164 “ 4 ?
 “ “ “ “ 250 “ 5 ?
 “ “ “ “ 205 “ 5 ?

ORAL PROBLEMS

1. An apple woman arranges 168 apples in 4 equal piles. How many apples in each pile?
2. If she had placed them in 6 equal piles, how many apples would there have been in each pile?
3. She places 145 of the apples in paper bags, each bag containing 5 apples. How many bags are used?
4. She sells her apples at the rate of 2 for 3 ct. How much money will she get for 30 apples?
5. 4 boys buy 128 of the apples. They share equally. How many apples does each boy get?

WRITTEN EXERCISE

1. Divide: 375 by 5; 184 by 4; 234 by 3; 274 by 2; 178 by 3.
2. Divide: \$4.62 by 4; \$351 by 3; \$2.98 by 2; \$425 by 5; \$3.80 by 4.
3. Divide the following into 3 equal parts. Tell the value of each part.
 876 ft. 672 yd. 426 gal. 774 pt. 546 lb.

4. Find the quotients:

$$\begin{array}{r} 4 \overline{)496} \quad 2 \overline{)876} \quad 3 \overline{)687} \quad 5 \overline{)565} \quad 3 \overline{)912} \end{array}$$

5. How many times does 585 contain 5?

$$\begin{array}{cccccc} \text{"} & \text{"} & \text{"} & \text{"} & 678 & \text{"} & 3? \end{array}$$

$$\begin{array}{cccccc} \text{"} & \text{"} & \text{"} & \text{"} & 318 & \text{"} & 2? \end{array}$$

$$\begin{array}{cccccc} \text{"} & \text{"} & \text{"} & \text{"} & 416 & \text{"} & 4? \end{array}$$

WRITTEN PROBLEMS

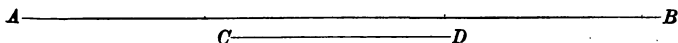
1. I paid \$1.45 for 5 lb. of meat. How much does 1 lb. cost? 3 lb.?

2. A railroad ticket costs 5 ct. How many tickets may be bought for \$3.85? For \$4? For \$5.15?

3. How many boxes are needed for 396 pieces of soap, if 4 pieces are placed in each box? If 6 pieces are placed in each box?

4. How many pints of milk may be bought for \$1.84 at 4 ct. a pint? How many quarts?

5. The distance from *A* to *B* is 374 mi. The distance from *C* to *D* is one third as great. What is the distance from *C* to *D*?



6. State another problem like No. 5. Solve it.

ORAL EXERCISE

1. Divide: 248 by 8; 408 by 8; 279 by 9.
2. Divide: 154 by 2; 222 by 3; 315 by 3.

3. Find quotients :

$$171 \div 3. \quad 618 \div 2. \quad 316 \div 2. \quad 723 \div 3. \quad 520 \div 4.$$

4. Find quotients :-

$$6) \underline{\$132}$$

$$5) \underline{\$1.60}$$

$$4) \underline{\$2.52}$$

$$3) \underline{\$288}$$

$$2) \underline{\$13.76}$$

$$4) \underline{\$37.20}$$

5. 258 qt. are how many times 6 qt.?

$$832 \text{ bu. " " " " 4 bu. ?}$$

$$228 \text{ in. " " " " 3 in. ?}$$

$$1,400 \text{ pt. " " " " 5 pt. ?}$$

$$\$2,532 \text{ " " " " \$4 ?}$$

ORAL PROBLEMS

1. A family uses 3 lb. of flour a day. In how many days will they use 196 lb. of flour?

2. The same family uses an average of 9 eggs a day. In how many days will they use 144 eggs?

3. The family uses 3 pt. of milk for each meal. In how many meals will they use 246 pt. of milk?

4. The cook uses 8 apples a day. In how many days will she use a barrel containing 248 apples?

5. A family of 7 people spends \$161 a month. What is the average amount spent by each one?

WRITTEN EXERCISE

1. Divide: 972 by 6; 294 by 7; 976 by 8; 516 by 3; 508 by 4.

2. Divide: 805 by 7; 702 by 6; 904 by 8; 704 by 4; 704 by 8.

3. $\$7.95 \div 5 = ?$ $\$3.71 \div 7 = ?$ $\$828 \div 9 = ?$
 $\$984 \div 8 = ?$ $\$2.76 \div 6 = ?$ $\$32.20 \div 4 = ?$

4. Find quotients:

6)930 9)981 8)960 7)910 6)714

5. 266 is 7 times what number?

486 is 9 " " "

736 is 8 " " "

954 is 6 " " "

1062 is 9 " " "

WRITTEN PROBLEMS

1. 8 bu. of grain were sold for \$4.56. Find the cost of 2 bu.? Of 4 bu.? (*Use direct method.*)

2. How many loaves of bread are purchased for \$7.02 at 6 ct. a loaf? How many at 3 ct. a loaf?

3. How many pounds in a barrel of flour, if 7 bbl. weigh 1372 lb.?

4. 8 books are packed in a box. How many boxes are needed for 584 books?

5. The cost of 16 caps is \$8.96. Find the cost of 8 caps at that rate; of 4 caps; of 2 caps; of 1 cap.

Divisors of One Order. Carrying. Remainders

1. Count by 6's to 36. How many 6's in 36?

Count by 6's to 37. How many 6's in 37? How many units are left over?

2. Count by 5's to 25. How many 5's in 25?

Count by 5's to 26. How many 5's in 26? How many units are left over?

3. Take 16 splints. Put 4 in a group. How many groups are there?

Take 19 splints. Put 4 in a group. How many groups are there? How many splints left over?

$$4 \overline{)19}$$

4 and 3 over

$$19 \div 4 = 4 \text{ and } 3 \text{ over}$$

$$3 \div 4 = \frac{3}{4} \quad 4\frac{3}{4} \text{ Ans.}$$

Write the example in this form:

$$4 \overline{)19} \\ 4\frac{3}{4}$$

Notice that the remainder is written in fractional form as part of the quotient.

4. Divide 361 by 2.

$$2 \overline{)361} \\ 180\frac{1}{2}$$

PROOF.

To prove example 4, multiply the quotient (180) by the divisor (2), and add the remainder (1) to the product. The sum should be the dividend (361).

ORAL EXERCISE

1. Divide these numbers by 2: 20, 23, 12, 17, 19.
2. Divide these numbers by 4: 24, 38, 81, 21, 30.
3. Divide these numbers by 5: 35, 61, 32, 14, 27.

4. Which of the following numbers can be divided by 3 without a remainder: 12, 16, 21, 30.

5. Which of the following numbers are *exactly divisible* by 6: 21, 37, 18, 42, 50, 49, 24.

ORAL PROBLEMS

1. How many 6-ct. loaves of bread can be bought for 75 ct.? How much money will be left over?

2. How many gallons in 103 qt.?

3. How many yards in 197 ft.?

4. How many 4-ct. balls can I buy for 1 dollar and a quarter? How much change do I receive?

5. A class learns 4 new words in one lesson. How long will it take the class to learn 203 words?

WRITTEN EXERCISE

1. Divide: 728 by 3; 395 by 2; 497 by 6; 936 by 5; 574 by 4.

2. $\$9.73 \div 3 = ?$ $\$8.95 \div 6 = ?$ $\$5.27 \div 4 = ?$

$\$17.93 \div 2 = ?$ $\$2.16 \div 5 = ?$ $\$10.14 \div 6 = ?$

3. Divide 377 bu. into 3 equal parts.

“ 945 gal. “ 6 “ “

“ 776 in. “ 5 “ “

“ 833 ft. “ 4 “ “

“ 947 lb. “ 2 “ “

4. Find quotients: 1347 divided by 2; 3617 divided by 3; 4521 divided by 5.

5. Divide: 2877 by 4; 3546 by 5.

WRITTEN PROBLEMS

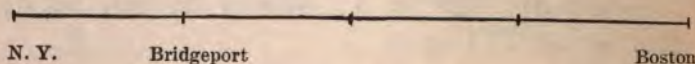
1. Find the cost of 1 coat if 8 coats cost \$116; of 3 coats; of 5 coats.

2. A man is paid \$15.50 for 6 days' work. How much does he receive a day?

3. How many hours will it take a horse to go 64 mi. at 4 mi. an hour?

4. How many pounds of oatmeal may be bought for \$3.35 at 4 ct. a pound?

5. The distance from New York to Boston is 232 mi. The distance from New York to Bridgeport is $\frac{1}{4}$ as great. How far is it from New York to Bridgeport? How far is it from Bridgeport to Boston? (*Draw a diagram.*)



ORAL EXERCISE

1. Divide: 271 by 3; 165 by 4; 123 by 2.

2. Divide: 208 by 2; 308 by 3; 104 by 4.

3. $167 \div 4 = ?$ $185 \div 3 = ?$ $165 \div 4 = ?$

4. Find the quotients:

2)\$198 3)\$2.14 2)\$3.16 4)\$184 5)\$206

5. Divide: 201 by 2; 301 by 3; 402 by 4.
6. Tell all the multiples of 2 in examples 1 and 2.

ORAL PROBLEMS

1. Put 57 lb. of flour into 8 bags of equal size. How many pounds in each bag?
2. A man receives \$1.23 for working 6 hr. How much does he earn each hour?
3. How many strips of paper each 3 ft. wide are needed for a wall 74 ft. wide?
4. 54 apples are placed in 6 baskets of equal size. How many apples are there in each basket?
5. One man can build a stone wall in 54 da. In how many days can 7 men build the wall at that rate?

WRITTEN EXERCISE

1. $3937 \div 4 = ?$ $4621 \div 9 = ?$ $3758 \div 8 = ?$
 $2964 \div 7 = ?$ $3813 \div 6 = ?$ $4796 \div 7 = ?$
2. Divide: \$63.71 by 8; \$48.95 by 6; \$2376 by 7; \$8119 by 9; \$29.13 by 4.
3.
How many times are 9 ft. contained in 2939 ft.?
" " " " 7 in. " " 4513 in.?
" " " " 6 bu. " " 3621 bu.?
" " " " 8 pt. " " 5606 pt.?
" " " " 4 qt. " " 3620 qt.?

4. Divide 2841 into 7 equal parts.

"	4026	"	5	"	"
"	4237	"	6	"	"
"	4003	"	8	"	"
"	3602	"	9	"	"

5. 3741 is how many times 3? 6?

5833 " " " " 4? 8?

7419 " " " " 2? 8?

WRITTEN PROBLEMS

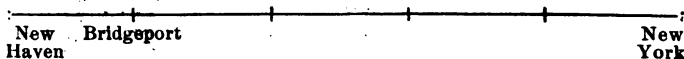
1. A grocer put 30 lb. of sugar into 8 bags.
How many pounds in each bag?

2. A railroad charges 3 ct. a mile for fare.
How many miles may I ride for \$ 2.20? For
\$5.40? For \$ 8.20?

3. How many yards in 298 ft.?

4. It requires 50 min. to hem 6 handkerchiefs.
How long to hem 1 handkerchief at that rate?

5. The distance from New Haven to New York
is 5 times the distance from New Haven to Bridge-
port. The distance from New Haven to New York
is 73 mi. How far is it from New Haven to
Bridgeport? (*Draw a diagram.*)



Divisors 10, 20, etc., to 90

Review the division table of tens, page 118.

1. Divide: 80 by 10; 40 by 10; 70 by 10; 30 by 10.

How many times does 60 contain 10?

How many times does 90 contain 10?

How many times does 30 contain 10?

How many times does 20 contain 10?

Give a simple rule for dividing numbers like 20, 30, 40, 50, by 10.

To divide by 10 a number that ends in 0, strike out (cancel) the 0 in the dividend. *4 times*

$$\begin{array}{r} \text{e.g. } 10 \overline{)80} \\ \underline{8} \\ 0 \end{array} \quad \begin{array}{r} 10 \overline{)60} \\ \underline{6} \\ 0 \end{array} \quad \begin{array}{r} 10 \overline{)370} \\ \underline{37} \\ 0 \end{array} \quad \begin{array}{r} 10 \overline{)3960} \\ \underline{396} \\ 0 \end{array}$$

2. Count by 20's to 80. How many 20's in 80?

Count by 30's to 120. How many 30's in 120?

Count by 50's to 350. How many 50's in 350?

Give a simple rule for dividing numbers like 80, 120, 350 by 20, 30, 50, etc.

Learn this method of dividing numbers that end in 0 by numbers like 20, 30, 40, 50.

$$\begin{array}{r} 20 \overline{)180} \\ \underline{18} \\ 0 \end{array} \quad \begin{array}{r} 50 \overline{)750} \\ \underline{15} \\ 0 \end{array} \quad \begin{array}{r} 40 \overline{)9840} \\ \underline{246} \\ 0 \end{array}$$

3. How many 10's in 17? What is the remainder?

How many 10's in 63? What is the remainder?

How many 10's in 294? What is the remainder?

How many 10's in 1745? What is the remainder?

Learn this method of dividing by 10 when the dividend does *not* end in 0.

$$\begin{array}{r} 10 \overline{)17} \\ \underline{10} \\ 7 \\ 10 \end{array} \quad \begin{array}{r} 10 \overline{)193} \\ \underline{10} \\ 9 \\ 10 \end{array} \quad \begin{array}{r} 10 \overline{)1349} \\ \underline{10} \\ 4 \\ 10 \end{array}$$

4. How many 20's in 87? What is the remainder?

How many 30's in 127? What is the remainder?

How many 50's in 432? What is the remainder?

How many 80's in 653? What is the remainder?

Learn this method of dividing by 20, 30, 40, etc., when the dividend does *not* end in 0.

$$\begin{array}{r} 20 \overline{)87} \\ \underline{40} \\ 47 \\ 80 \end{array} \quad \begin{array}{r} 30 \overline{)127} \\ \underline{60} \\ 67 \\ 90 \end{array} \quad \begin{array}{r} 50 \overline{)4371} \\ \underline{250} \\ 187 \\ 950 \end{array}$$

ORAL EXERCISE

- Divide by 10:
30, 52, 90, 126, 439, 3009, 175,000.
- Divide by 20, by 40:
80, 120, 324, 756, 800, 1800, 2702.
- Divide by 30, by 60:
120, 150, 214, 762, 843, 6847, 9009.
- How many 90's in:
180, 274, 378, 9037, 19,183.
- Divide by 70, by 80:
560, 1124, 8341, 9000, 16,453.

ORAL PROBLEMS

1. 20 loaves of bread weigh 180 oz. Find the weight of each loaf.
2. A boy uses 120 sheets of paper in a month of 30 da. If he uses equal amounts each day, how many sheets does he use each day?
3. A class of 50 pupils uses 750 sheets of paper a week. How many sheets does each child use?
4. \$4.80 will pay for how many 20 ct. books?
5. How many 30-da. months in 780 da.?

ORAL PROBLEMS

1. A horse runs 10 mi. each hour. How long will it take him to make a trip of 96 mi.?
2. A postal clerk stamps 60 letters a minute. How many minutes will it take him to stamp 932 letters?
3. How many cherry pies can a cook make from 856 cherries, if she puts 40 cherries in each pie?
4. A conductor collects 638 nickels in 20 trips. What is the average number for each trip?
5. What number multiplied by 70 will give 980?

Divisors of Two Orders. Units' Figures 1 or 2

1. Divide 374 by 21.

$$\begin{array}{r}
 17\cancel{1}\frac{7}{21} \\
 21 \overline{) 374} \\
 \underline{210} \\
 164 \\
 \underline{147} \\
 17
 \end{array}$$

$374 \div 21 = 1$ ten (10) and a remainder.

$10 \times 21 = 210$. $274 - 210 = 164$ remainder.

$164 \div 21 = 7$ units and a remainder.

$7 \times 21 = 147$; $164 - 147 = 17$ remainder. $17\frac{7}{21}$ Ans.

A shorter way is:

$$\begin{array}{r}
 17\cancel{1}\frac{7}{21} \\
 21 \overline{) 374} \\
 \underline{21} \times \\
 164 \\
 \underline{147} \\
 17
 \end{array}$$

Ans. $17\frac{7}{21}$

37 is the 1st partial dividend.

$37 \div 21 = 1$.

$1 \times 21 = 21$; $37 - 21 = 16$ remainder.

Bring down 4 from the dividend.

164 is the 2d partial dividend.

$164 \div 21 = 7$; $7 \times 21 = 147$; $164 - 147 = 17$ remainder. $17\frac{7}{21}$ Ans.

2. Divide 4867 by 22.

$$\begin{array}{r}
 221\frac{5}{22} \\
 22 \overline{) 4867} \\
 \underline{44} \ 00 \\
 4 \ 67 \\
 \underline{4} \ 40 \\
 27 \\
 \underline{22} \\
 5
 \end{array}$$

$221\frac{5}{22}$ Ans.

$4,867 \div 22 = 2$ hundreds (200) and a remainder.

$200 \times 22 = 4400$; $4867 - 4400 = 467$ remainder.

$467 \div 22 = 2$ tens (20) and a remainder.

$20 \times 22 = 440$; $467 - 440 = 27$ remainder.

$27 \div 22 = 1$ and a remainder.

$1 \times 22 = 22$; $27 - 22 = 5$ remainder.

$221\frac{5}{22}$ Ans.

A shorter way is :

$$\begin{array}{r}
 221\frac{5}{2} \\
 22 \overline{) 48 \overline{) 67}} \\
 \underline{44 \times \times} \\
 46 \\
 \underline{44} \\
 27 \\
 \underline{22} \\
 5 \\
 221\frac{5}{2} \text{ Ans.}
 \end{array}$$

48 is the 1st partial dividend.
 $48 \div 22 = 2$ and a remainder.
 $2 \times 22 = 44$; $48 - 44 = 4$ remainder.
 Bring 6 down from the dividend.
 46 is the 2d partial dividend.
 $46 \div 22 = 2$ and a remainder.
 $2 \times 22 = 44$; $46 - 44 = 2$.
 Bring down 7 from the dividend.
 27 is the 3d partial dividend.
 $27 \div 22 = 1$ and a remainder.
 $1 \times 22 = 22$; $27 - 22 = 5$ remainder. $221\frac{5}{2}$ Ans.

NOTE. In this example, the second figure of the quotient (2) is the same as the first figure. Therefore, it is unnecessary to multiply the divisor by 2 again. Time may be saved by copying the product (44) from the line above.

3. Divide \$249.36 by 31.

$$\begin{array}{r}
 \$8.041\frac{2}{31} \\
 31 \overline{) \$249.36} \\
 \underline{248 \times} \\
 136 \\
 \underline{124} \\
 12 \\
 \$8.041\frac{2}{31} \text{ Ans.}
 \end{array}$$

Notice that the 2d partial dividend is 13.

13 cannot be divided by 31; write 0 in the quotient.

Bring 6 down from the dividend.

136 is the 3d partial dividend.

$136 \div 31 = 4$ and a remainder, etc.

Write the decimal point in the quotient above the decimal point in the dividend.

NOTE TO TEACHER. — Little time should be spent in developing the process of long division. It is one of the few portions of arithmetic that should be taught didactically. The longer forms in examples 1 and 2 are intended to give some justification of the process. But the scholar should learn the usual form without delay. The vertical lines used to indicate the partial dividends should be discarded as soon as possible. The writing of \times under the figures of the dividend to show that the figures have been brought down to the partial dividends should be continued.

Cross Reference: Multiplier of Two Orders, page 95.

WRITTEN EXERCISE

1. Divide: 2100 by 21; 6300 by 21; 8400 by 21
2. Find the quotients:

$$31 \overline{)9331}$$

$$31 \overline{)3720}$$

$$41 \overline{)8282}$$

3. Divide: \$ 67.41 by 21; \$ 50.63 by 61.
4. How many times does 168 contain 12?
 " " " " 2568 " 12?
 " " " " 2200 " 22?
5. Divide 8442 into 42 equal parts.
 " 1040 " 52 " "
 " 9632 " 32 " "

WRITTEN PROBLEMS

1. How many feet in 492 in.?
2. It is necessary to wind a clock every 21 da.
How many times must it be wound in 294 da.?
3. How many times 31 equals 589?
4. 41 pieces of candy fill 1 box. How many boxes are required for 861 pieces?

WRITTEN EXERCISE

1. Divide: 5125 by 41; 1040 by 52; 3328 by 32.

2. Find the quotients:

$$42 \overline{)2142}$$

$$52 \overline{)5304}$$

$$22 \overline{)2112}$$

3. Divide: \$ 24.36 by 42; \$ 65.92 by 32.

4. How many times does 7560 contain 72?

“ “ “ “ 8464 “ 92?

“ “ “ “ 1640 “ 82?

5. Divide 1148 into 82 equal parts.

“ 1368 “ 72 “ “

“ 1196 “ 92 “ “

WRITTEN PROBLEMS

1. A man's wages are \$ 22 a week. How many weeks will it take him to earn \$ 462?

2. 52 books cost \$ 6.24. How much does 1 book cost?

3. What number multiplied by 11 will equal 275?

4. A bin contains 31 bu. of grain. How many bins of that size are required for 403 bu.?

5. A packer packs 72 lead pencils in each box. How many boxes will be required to hold 648 pencils?

Divisors of Two Orders. Units' Figure greater than 2

1. Divide 877 by 45.

$ \begin{array}{r} 19\frac{2}{5} \\ 45 \overline{)877} \\ \underline{45 \times} \\ 427 \\ \underline{405} \\ 22 \end{array} $	<p>87 is the 1st partial dividend. $87 \div 45 = 1$ and a remainder. multiplying 45 by 1, and subtracting the product from 87, gives a remainder of 42. 427 is the 2d partial dividend. $427 \div 45 = 9$ and a remainder. multiplying 45 by 9, and subtracting the product from 427, gives a remainder of 22.</p>
$19\frac{2}{5} \text{ Ans.}$	$19\frac{2}{5} \text{ Ans.}$

NOTE TO TEACHER. — Give pupils abundant practice in working with a "trial divisor" and in obtaining approximate answers in division.

In introducing long division, begin with divisors having 1 or 2 in units' place. Follow by numbers having 9 or 8 in units' place, using as a trial divisor the 1st number of the next decade, *e.g.* for 89, use 90, etc.

2. Divide 196,006 by 97.

$ \begin{array}{r} 2,020\frac{6}{97} \\ 97 \overline{)196 006} \\ \underline{194 \times \times \times} \\ 200 \\ \underline{194} \\ 66 \end{array} $	<p>196 is the 1st partial dividend. 20 is the 2d partial dividend. 200 is the 3d partial dividend. 66 is the 4th partial dividend.</p>
$2020\frac{6}{97} \text{ Ans.}$	$2020\frac{6}{97} \text{ Ans.}$

NOTE. — In this example the third figure of the quotient (2) is the same as the first figure. Therefore, it is unnecessary to multiply the divisor by 2 again. Time may be saved by copying the product 194 from the line above.

3. Divide \$15.98 into 34 equal parts.

$$\begin{array}{r} \$.47 \\ 34 \overline{) \$15.98} \\ \underline{136 \times} \\ 238 \\ \underline{238} \end{array}$$

Follow the method used in the preceding examples.

Write the decimal point in the quotient above the decimal point in the dividend.

WRITTEN EXERCISE

- | | | | |
|-----------|-----------|-----------|-----------|
| 1. Divide | 644 | 1247 | 1620 |
| By | <u>29</u> | <u>42</u> | <u>48</u> |
| 2. Divide | 2496 | 2734 | 8674 |
| By | <u>62</u> | <u>79</u> | <u>38</u> |

3. Find quotients: $96 \overline{) 4535}$ $39 \overline{) 27.16}$ $59 \overline{) 1498}$

4. Find quotients: $48 \overline{) 1437}$ $89 \overline{) 8350}$ $32 \overline{) 9800}$

5. Divide 8642 yd. into 29 equal parts.

“ 6023 ft. “ 23 “ “
 “ 6424 in. “ 29 “ “

WRITTEN PROBLEMS

1. A family spends \$209 in 19 wk. How much is spent in 1 wk. at that rate?

2. They use a 196-lb. barrel of flour in 28 da. How many pounds do they use in 1 da. at that rate?

3. The father was a baker. In 89 da. he sold 5785 loaves of bread. What was the average number of loaves sold each day?

4. He sells 59 rolls every morning. How many mornings will it take him to sell 1180 rolls?

WRITTEN EXERCISE

1. Divide: \$2901 by 39; \$85.47 by 77; \$16.02 by 58.

2. How many times does 745 bu. contain 35 bu.?
 “ “ “ “ 642 oz. “ 48 oz.?

3. Find quotients:

$$63 \overline{)7643}$$

$$53 \overline{)8467}$$

$$75 \overline{)9436}$$

4. Divide: 6542 by 85; 5963 by 99; 6742 by 37.

5. Find quotients:

$$47 \overline{)1437}$$

$$35 \overline{)9800}$$

$$86 \overline{)8350}$$

WRITTEN PROBLEMS

1. The monthly rent receipts from an apartment house are \$459. Each tenant pays the same amount of rent. If there are 17 tenants, how much does each pay?

2. How long will it take a train going at the rate of 28 mi. per hour to make a run of 728 mi.?

3. How many blank books can be made from 870 sheets of paper, if each book contains 29 sheets?

4. By what number must 1872 be divided to give 39 for a quotient?

5. A man borrows \$342. He returns the money in equal monthly payments of \$38. In how many months will he be out of debt?

WRITTEN EXERCISE

1. Divide: 9364 in. by 49; 6754 gal. by 38; \$160.16 by 44.

2. Find quotients:

$$66 \overline{)9986}$$

$$78 \overline{)6567}$$

$$67 \overline{)9864}$$

3. How many times is 55 lb. contained in 4326 lb.?

How many times is 69 gal. contained in 5364 gal.?

How many times is \$29 contained in \$3219?

4. Find: $\frac{1}{97}$ of 9924; $\frac{1}{89}$ of 8436; $\frac{1}{94}$ of 9532.

5. Divide 6423 wk. into 88 equal parts.

Divide 2449 T. into 66 equal parts.

Divide 12,345 mi. into 54 equal parts.

WRITTEN PROBLEMS

1. The product of 2 numbers is 1222. One of the numbers is 26. What is the other?

2. If 864 soldiers march 16 abreast, how many rows of soldiers will there be?

3. A train makes a run of 425 mi. in 17 hr. What is the rate per hour?

4. If a man saves \$19 each month, how long will it take him to save \$342?

5. I paid \$108 for 18 bbl. of apples. How much did they cost me per barrel?

WRITTEN EXERCISE

1. Divide: \$34.65 by 35; \$15.30 by 53; \$12.40 by 65.

2. Divide: 8753 by 34; 9342 by 58; 12,368 by 45.

3. Find quotients:

$$63 \overline{)19,502}$$

$$84 \overline{)21,364}$$

$$92 \overline{)88,709}$$

4.

How many times does 6432 mo. contain 25 mo.?

“ “ “ “ 5432 da. “ 36 da.?

“ “ “ “ 8463 qt. “ 46 qt.?

5. How much is: $\frac{1}{24}$ of 3747; $\frac{1}{37}$ of 8300; $\frac{1}{28}$ of 6541.

WRITTEN PROBLEMS

1. A dealer sends to the publisher an order for 47 arithmetics. The bill is \$14.57. How much does each book cost?

2. At 79 ct. per yard, how many yards of carpet can be bought for \$20.54?

3. If 26 pianos cost \$ 6500, what will 1 cost?
4. How many yards of ribbon costing 17 ct. per yard can be bought for 68 ct.?
5. The product of two numbers is 5472. One of the numbers is 96. What is the other?

WRITTEN EXERCISE

1. Divide: \$ 1440 by 75; 6400 by 26; 9365 pk. by 58 pk.
2. Find quotients:

$$\begin{array}{r} 76 \overline{)90,006} \quad 39 \overline{)46,158} \quad 59 \overline{)76,249} \end{array}$$
3. Divide: 19,702 by 75; 20,006 by 63; 90,006 by 76.
4. Divide 4387 pt. into 39 equal parts.
 " 9407 qt. " 68 " "
 " 15,002 lb. " 92 " "
5. How much is: $\frac{1}{43}$ of 17,301; $\frac{1}{65}$ of 28,507; $\frac{1}{98}$ of 39,006.

WRITTEN PROBLEMS

1. 945 pupils are placed in classes. Each class has a register of 45 pupils. How many classes are there?
2. \$725 will pay for how many \$25 sewing machines?
3. If each class gets 35 pencils, how many classes can be supplied out of 70 doz. pencils?

4. I divide 935 picture cards equally among 55 children. How many cards will each child receive?

5. How many 25-ct. dolls can be bought for \$5?

6. A troop of 1728 soldiers is arranged with 24 soldiers in each squad. How many squads in the troop?

7. 33 bbl. of flour brought \$214.50. What was the price per barrel?

8. At \$34 each, how many head of cattle can be bought for \$646?

9. How long will it take an automobile to run 646 mi. at the rate of 13 mi. an hour?

10. The school attendance in our class for 23 da. was 805. What was the daily attendance?

11. If 18 bbl. of apples cost \$73, how much will 24 bbl. cost?

12. A man makes \$980 a year. He spends $\frac{4}{5}$ of it. How much does he save?

13. A dealer pays \$3.84 for a dozen arithmetics. How much must he pay for 96?

14. At \$64 a dozen, how much must a jeweler pay for 3 clocks?

15. A grocer bought a box containing 372 eggs. He sells them for 48 ct. per dozen. How much money does he take in?

FRACTIONS

An Object divided into Halves

If we cut an apple into two *equal* parts, what is each part called?



"One half" is written : $\frac{1}{2}$.

ORAL PROBLEMS

1. On his birthday, William got a half-dollar from his father and a half-dollar from his uncle. How much money did William get from both?

2. I bought $\frac{1}{2}$ dollar's worth of goods in a shop and gave 1 dollar in payment. How much *change* should I get?

3. John's mother divided a cake equally between John and his sister Kate. What part of the cake did John receive? What part did Kate receive?

4. The noon *recess* is 1 hr. long. If Henry takes $\frac{1}{2}$ hr. to get his lunch, how much time has he left?

5. Read the following numbers:

$2\frac{1}{2}$, $10\frac{1}{2}$, $\frac{2}{2}$, $13\frac{1}{2}$, $170\frac{1}{2}$, $205\frac{1}{2}$, $583\frac{1}{2}$, $900\frac{1}{2}$, $100\frac{1}{2}$.

WRITTEN EXERCISE

Copy and complete :

1. $\frac{1}{2} + \frac{1}{2} = ?$

3. $1 + \frac{1}{2} = ?$

2. $1 - \frac{1}{2} = ?$

4. $1\frac{1}{2} - \frac{1}{2} = ?$

Write in figures :

5. One and one half. 6. Three and one half.

7. Fifteen and one half. 8. Sixty and one half.

9. One hundred three and one half.

10. Five hundred twenty and one half.

11. Two thousand six hundred eleven and one half.

Find the sums :

12. 67

$12\frac{1}{2}$

6

13. $25\frac{1}{2}$

$48\frac{1}{2}$

20

14. $104\frac{1}{2}$

209

$657\frac{1}{2}$

Find the remainders :

15. $48\frac{1}{2}$

20

16. $114\frac{1}{2}$

$58\frac{1}{2}$

17. 206

$98\frac{1}{2}$

SIGHT EXERCISE

Give the missing numbers :

1. $2\frac{1}{2} + \frac{1}{2} = ?$

4. $6\frac{1}{2} + 5 = ?$

7. $12\frac{1}{2} + 12\frac{1}{2} = ?$

$1\frac{1}{2} = ?$

5. $5 - 1\frac{1}{2} = ?$

8. $12\frac{1}{2} - 2\frac{1}{2} = ?$

$2\frac{1}{2} = ?$

6. $7\frac{1}{2} - 3 = ?$

9. $5 - 2\frac{1}{2} = ?$

WRITTEN PROBLEMS

1. A man spent \$35 for a bicycle, \$10½ for a gun, and \$17½ for a watch. How much did he spend in all?

2. To reach a certain village, I must travel 150 *mi.* by train, 38½ *mi.* by boat, and 7½ *mi.* by wagon. How far must I travel all together to reach my *destination*?

3. Mr. Brown's farm had 247 *A.* in *pasture*, 87½ *A.* planted with grain, and 13½ *A.* used for buildings and lawn. How many acres in the farm?

4. A salesman who earned \$50 a week spent \$10½ a week for board and \$10 a week for other expenses. How much did he have left?

5. A cart loaded with coal weighed 3157 *lb.*; the wagon when unloaded weighed 1079½ *lb.* How much did the coal alone weigh?

ORIGINAL PROBLEMS

Make problems containing the following numbers:

1. $15\frac{1}{2}$	2. $10\frac{1}{2}$	3. $16\frac{1}{2}$	4. $12\frac{1}{2}$
$+ 5$	$+ 2\frac{1}{2}$	$+ 3\frac{1}{2}$	$+ 12\frac{1}{2}$
5. $4\frac{1}{2}$	6. $7\frac{1}{2}$	7. $20\frac{1}{2}$	8. $15\frac{1}{2}$
$+ 4\frac{1}{2}$	$+ 7\frac{1}{2}$	$- 4\frac{1}{2}$	$- 2\frac{1}{2}$
9. 15	10. 25	11. 17	12. 25
$- 4\frac{1}{2}$	$- 2\frac{1}{2}$	$- 8\frac{1}{2}$	$- 12\frac{1}{2}$

An Object divided into Fourths



1. If you cut an apple into four equal parts, what is each part called?

One fourth is written : $\frac{1}{4}$.

One fourth is also called a quarter.

ORAL EXERCISE

1. Draw a line 1 in. long; add to it $\frac{1}{2}$ in. How long is $1 \text{ in.} + \frac{1}{2} \text{ in.}$?

2. Draw a line $\frac{1}{4}$ in. long. What must be added to it to make a line 1 in. long?

3. Draw a line $\frac{3}{4}$ in. long; add to it $1\frac{1}{4}$ in. What is the sum of $\frac{3}{4}$ in. and $1\frac{1}{4}$ in.?

4. Find by measurement the sum of $1\frac{1}{2}$ in., $1\frac{1}{4}$ in., and $\frac{3}{4}$ in.

5. From a line 5 in. long, cut off $1\frac{3}{4}$ in. Cut off again $1\frac{1}{2}$ in.; then cut off again $\frac{3}{4}$ in. Find the length of the remainder.

6. Find by measurement the sum of $2\frac{1}{2}$ in. and $1\frac{1}{4}$ in.; and also the difference.

7. From the sum of $3\frac{3}{4}$ and $2\frac{1}{4}$ subtract the sum of $1\frac{1}{2}$ and $1\frac{1}{4}$.

NOW DO ALL THE PROBLEMS IN THE ABOVE EXERCISE WITHOUT MEASUREMENT.

ORAL PROBLEMS

1. John's mother divided a cake into fourths and gave $\frac{1}{4}$ to John and $\frac{1}{4}$ to Kate. How much was left?

2. I bought $\frac{1}{4}$ dollar's worth of eggs at the grocer's and gave the grocer $\frac{1}{2}$ dollar. How much change should I get?

3. On his birthday, William got $\frac{1}{4}$ dollar from his father and $\frac{1}{4}$ dollar from his uncle. How much money did he get from both?

4. The noon recess is 1 hr. long. Henry takes $\frac{1}{4}$ hr. to go home, $\frac{1}{4}$ hr. to eat his lunch, and $\frac{1}{4}$ hr. to return to school. How much time has he left?

WRITTEN EXERCISE

Copy and complete:

1. $\frac{1}{2}$ of $\frac{1}{2} = ?$

6. $1 - \frac{1}{4} = ?$

2. $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = ?$

7. $1 - \frac{2}{4} = ?$

3. $\frac{1}{4} + \frac{1}{4} = ?$

8. $1 - \frac{3}{4} = ?$

4. $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = ?$

9. $1 + \frac{1}{4} = ?$

5. $\frac{1}{2} + \frac{1}{4} = ?$

10. $1\frac{1}{4} - \frac{1}{4} = ?$

WRITTEN EXERCISE

1. Write:

One and three quarters.

Three and one quarter.

Fourteen and three quarters.

Six hundred five and one quarter.

Five hundred and three quarters.

Find the sums :

2. 267 3. $421\frac{1}{4}$ 4. $2601\frac{1}{4}$ 5. $9081\frac{1}{4}$ 6. $355\frac{3}{4}$ 7. $1441\frac{1}{4}$
 $3081\frac{1}{4}$ $891\frac{1}{4}$ $7481\frac{1}{4}$ $78\frac{1}{2}$ $78\frac{1}{4}$ $793\frac{1}{2}$
25 218 691\frac{1}{4} 34 600 47\frac{3}{4}

Find the remainders :

8. $425\frac{3}{4}$ 9. $181\frac{1}{2}$ 10. $760\frac{3}{4}$ 11. 768 12. 600
 $2731\frac{1}{4}$ $71\frac{1}{4}$ $2941\frac{1}{2}$ $251\frac{1}{4}$ $361\frac{1}{2}$

SIGHT EXERCISE

Give the missing numbers :

1. $21\frac{1}{2}$ 2. $1\frac{1}{4}$ 3. $31\frac{1}{4}$ 4. $2\frac{3}{4}$
 $+ 31\frac{1}{4}$ $+ 1\frac{1}{4}$ $+ 1\frac{1}{2}$ $+ 2\frac{1}{4}$
5. $101\frac{1}{4}$ 6. $71\frac{1}{4}$ 7. $41\frac{1}{4}$ 8. $51\frac{1}{2}$
 $+ 12$ $+ 8\frac{3}{4}$ $- 21\frac{1}{4}$ $- 21\frac{1}{4}$
9. $7\frac{3}{4}$ 10. $61\frac{1}{4}$ 11. $121\frac{1}{2}$ 12. $10\frac{3}{4}$
 $- 21\frac{1}{2}$ $- 3$ $- 41\frac{1}{4}$ $- 51\frac{1}{2}$
13. 10 14. 12 15. 20 16. 8
 $- \frac{1}{2}$ $- 21\frac{1}{2}$ $- 41\frac{1}{4}$ $- 3\frac{3}{4}$
17. 15 18. 21 19. $101\frac{1}{4}$ 20. $100\frac{3}{4}$
 $- 5\frac{3}{4}$ $- 51\frac{1}{2}$ $- 4\frac{3}{4}$ $+ 501\frac{1}{2}$

WRITTEN PROBLEMS I

1. A tailor used $2\frac{1}{2}$ yd. of cloth to make a coat, $1\frac{3}{4}$ yd. to make a pair of trousers, and $\frac{1}{2}$ yd. to make a vest. How many yards of cloth did he use to make the *entire* suit?

2. A tailor pays his *foreman* \$ $4\frac{1}{2}$ a day, a *journeyman* \$ $3\frac{1}{4}$ a day, and an *apprentice* \$2 a day. How much wages in all does he pay a day?

3. A tailor *charged* a merchant \$ $17\frac{1}{4}$ for a suit of clothes; the merchant sold the suit for \$25. How much did the merchant *gain*?

4. A merchant bought cloth for \$ $1\frac{3}{4}$ a yard and sold it for \$3 a yard. How much did he gain on *each* yard?

5. A man earns \$ $20\frac{3}{4}$ a week; his *weekly* expenses are \$ $15\frac{1}{4}$ a week. How much does he save every week?

6. A dressmaker charged for making a dress, — \$ $6\frac{1}{2}$ for cloth, \$ $1\frac{1}{4}$ for lining, \$ $5\frac{1}{4}$ for labor. What was the entire cost?

7. A journeyman tailor's earnings for one week were as follows: Monday, \$ $3\frac{1}{2}$; Tuesday, \$3; Wednesday, \$ $4\frac{1}{4}$; Thursday, \$ $2\frac{1}{2}$; Friday, \$ $3\frac{3}{4}$; Saturday, \$3. What were his entire earnings for the week?

WRITTEN PROBLEMS II

(For Review.)

1. A grocer mixed together $28\frac{1}{2}$ lb. Maracaibo coffee, $10\frac{1}{4}$ lb. Rio coffee, and $6\frac{1}{4}$ lb. Mocha coffee. How many pounds in the mixture?

2. In a running race the winner ran five miles in $33\frac{3}{4}$ min.; he ran the first mile in $6\frac{1}{4}$ min., the second in $6\frac{3}{4}$ min., the third in 7 min., and the fourth in $7\frac{1}{2}$ min. In what time did he run the fifth, or last mile?

3. If a man spends $9\frac{1}{4}$ hr. in his work every day and $7\frac{1}{4}$ hr. in sleep, how many hours has he left for other uses?

4. A boy earned $\$1\frac{3}{4}$ by *weeding* a garden, $\$1\frac{1}{4}$ by picking berries, and $\$\frac{1}{2}$ by doing errands. How much did he earn in all?

5. Marion saved \$4 toward Christmas presents; she bought for her mother a comb for $\$1\frac{1}{2}$, and for her father a necktie for $\$1\frac{1}{4}$; the remainder she spent for a knife for her brother. How much did the knife cost?

ORIGINAL PROBLEMS

Make problems containing the following numbers:

$$\begin{array}{r} 1. \quad 10\frac{1}{4} \\ + 5\frac{1}{4} \\ \hline \end{array}$$

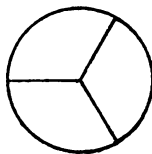
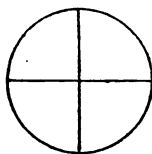
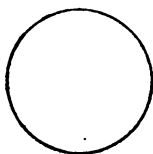
$$\begin{array}{r} 2. \quad 6\frac{1}{2} \\ + 1\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 3\frac{3}{4} \\ + 4\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 12\frac{1}{2} \\ + 2\frac{1}{2} \\ \hline \end{array}$$

5.	$9\frac{3}{4}$	6.	$25\frac{1}{4}$	7.	$15\frac{1}{4}$	8.	$12\frac{3}{4}$
	$+ 11\frac{1}{4}$		$+ 2\frac{1}{4}$		$- 10$		$- 3\frac{1}{4}$
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9.	$9\frac{1}{2}$	10.	$11\frac{3}{4}$	11.	20	12.	10
	$- 3\frac{1}{4}$		$- 10\frac{1}{2}$		$- 3\frac{1}{4}$		$- 2\frac{3}{4}$
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An Object divided into Thirds



ORAL EXERCISE

- How many thirds in a whole?
- How much is $\frac{1}{3} + \frac{1}{3}$?
- What must be added to $\frac{2}{3}$ to make a whole?
- Subtract $\frac{1}{3}$ from $\frac{2}{3}$.
- Add $\frac{1}{3}$ yd. to $\frac{2}{3}$ yd.
- What is the difference between 1 qt. and $\frac{1}{3}$ qt.?
- From 1 gal. take $\frac{1}{3}$ gal. How much is left?

ORAL PROBLEMS

- One third of a barber's pole is painted red, $\frac{1}{3}$ is painted white, and the rest is painted blue. What part of the pole is painted blue?

2. Jane bought a yard of muslin, and used $\frac{1}{3}$ of it to cover her books. What part of a yard did she have left?

3. The noon recess is 1 hr. long. If Henry takes $\frac{2}{3}$ of an hour to get his lunch, how much time has he left?

4. A farmer has $\frac{1}{3}$ of his farm planted with corn and $\frac{1}{3}$ with potatoes; the rest is pasture. What part of his land is used for pasture?

5. A boy spent $\frac{1}{3}$ of his money for a sled and $\frac{1}{3}$ for skates. What part of his money had he left?

WRITTEN EXERCISE

Copy and complete :

1. $\frac{1}{3} + \frac{1}{3} = ?$

4. $1 - \frac{1}{3} = ?$

2. $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = ?$

5. $\frac{2}{3} - \frac{1}{3} = ?$

3. $1 + \frac{1}{3} = ?$

6. $\frac{1}{3} - \frac{1}{3} = ?$

7. $1\frac{1}{3} - \frac{1}{3} = ?$

WRITTEN EXERCISE

- Add: Three and one third.
Five and one third.
Twelve and one third.

Find the sums :

2. $64\frac{1}{3}$

3. $219\frac{2}{3}$

4. $608\frac{1}{3}$

5. $257\frac{1}{3}$

$10\frac{1}{3}$

63

$93\frac{2}{3}$

$60\frac{1}{3}$

147

$19\frac{1}{3}$

$218\frac{1}{3}$

$700\frac{1}{3}$

Find the remainders :

6. $462\frac{2}{3}$	7. $700\frac{1}{3}$	8. 589	9. 810	10. 500
<u>$319\frac{1}{3}$</u>	<u>$286\frac{1}{3}$</u>	<u>$327\frac{1}{3}$</u>	<u>$675\frac{2}{3}$</u>	<u>$6\frac{1}{3}$</u>

SIGHT EXERCISE

Give the missing numbers :

1. 10 <u>$+ 3\frac{1}{3}$</u>	2. $2\frac{1}{3}$ <u>$+ 3\frac{1}{3}$</u>	3. $1\frac{1}{3}$ <u>$+ 9$</u>	4. $5\frac{2}{3}$ <u>$+ 5\frac{1}{3}$</u>
5. $4\frac{1}{3}$ <u>$+ 12\frac{2}{3}$</u>	6. $1\frac{2}{3}$ <u>$+ 15\frac{1}{3}$</u>	7. $3\frac{1}{3}$ <u>$- 2$</u>	8. $7\frac{2}{3}$ <u>$- 2\frac{1}{3}$</u>
9. $22\frac{2}{3}$ <u>$- 9\frac{2}{3}$</u>	10. 12 <u>$- \frac{2}{3}$</u>	11. 10 <u>$- 6\frac{2}{3}$</u>	12. 20 <u>$- 3\frac{1}{3}$</u>

WRITTEN PROBLEMS I

1. I find that my parlor *requires* $56\frac{1}{3}$ yd. of carpet, my halls require $37\frac{1}{3}$ yd., and the other rooms $105\frac{1}{3}$ yd. How many yards in all are required?

2. A farm of $110\frac{2}{3}$ A. has $57\frac{1}{3}$ A. under *cultivation*, the rest being *fallow*. How many acres are fallow?

3. Upon leaving my home to go to business every morning, I walk for $2\frac{1}{3}$ min. to the car, I ride for 25 min. in the car, and then walk for $3\frac{1}{3}$ min. to the office. How long do I require to go from home to the office?

4. If $28\frac{1}{3}$ yd. are cut from a piece of cloth containing 40 yd., how many yards are left?

5. A dealer bought $8\frac{1}{3}$ doz. eggs from one farmer, $12\frac{2}{3}$ doz. from another farmer, and $10\frac{1}{3}$ doz. from a third farmer. How many dozen eggs did he purchase in all?

WRITTEN PROBLEMS II

1. A boy walked $1\frac{2}{3}$ mi. to the house of his friend, then 2 mi. to the post office, and then $1\frac{1}{3}$ mi. to his own home. How far did he walk in all?

2. The boy spent $\frac{2}{3}$ of an *hour* in going to his friend's house, $1\frac{1}{3}$ hr. in going to the post office, and 1 hr. in going home. How long a time was he away from home?

3. A boat took 3 hr. to go down the river and return; $1\frac{1}{3}$ hr. were required to travel down. How long did it take to travel back?

4. From a piece of velvet 40 yd. long a *merchant* cut off $12\frac{1}{3}$ yd. for one *customer* and $20\frac{1}{3}$ yd. for another. How many yards remained?

5. A flag pole 45 ft. long stands in the school yard; $8\frac{2}{3}$ ft. of the pole's length are buried below the surface of the ground. What is the length of the pole above the ground?

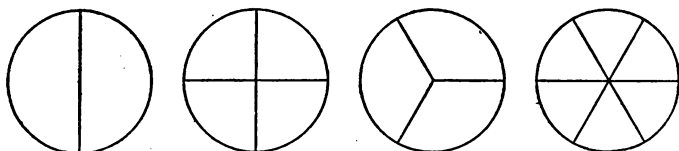
6. On a trip between New York and Albany a train traveled $50\frac{1}{3}$ mi. the first hour, 47 mi. the second hour, and $44\frac{2}{3}$ mi. the third hour. How far did the train go in the 3 hr.?

ORIGINAL PROBLEMS

Make problems containing the following numbers:

1.	2.	3.	4.
$4\frac{1}{3}$ yd.	$10\frac{2}{3}$ hr.	$10\frac{1}{3}$ doz.	$5\frac{1}{3}$ ft.
$+ 7\frac{2}{3}$ yd.	$+ 12$ hr.	$+ 7\frac{1}{3}$ doz.	$+ 6$ ft.
<hr/>			
5.	6.	7.	8.
$10\frac{2}{3}$ yd.	$14\frac{1}{3}$ hr.	15 doz.	20 ft.
$- 6\frac{1}{3}$ yd.	$- 8\frac{1}{3}$ hr.	$- 2\frac{1}{3}$ doz.	$- 6\frac{2}{3}$ ft.
<hr/>			

An Object divided into Sixths



What is each part called when a circle is divided into 2 equal parts? Into 3 equal parts? Into 4 equal parts? Into 5 equal parts? Into 6 equal parts?

Read and write:

One sixth $\frac{1}{6}$

Four sixths $\frac{4}{6}$

Two sixths $\frac{2}{6}$

Five sixths $\frac{5}{6}$

Three sixths $\frac{3}{6}$

Six sixths $\frac{6}{6}$

How much is:

1. $\frac{1}{6} + \frac{1}{6}$? 3. $\frac{1}{6} + \frac{3}{6}$? 5. $\frac{3}{6} + \frac{2}{6}$? 7. $\frac{5}{6} + \frac{1}{6}$?

2. $\frac{2}{6} + \frac{1}{6}$? 4. $\frac{2}{6} + \frac{2}{6}$? 6. $\frac{4}{6} + \frac{1}{6}$? 8. $1 - \frac{1}{6}$?

To make a whole, what must be added :

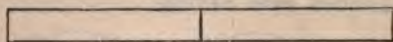
9. To $\frac{5}{6}$? 10. To $\frac{4}{6}$? 11. To $\frac{3}{6}$? 12. To $\frac{2}{6}$?

One Half, One Third, and One Sixth Compared

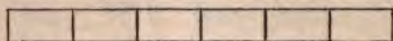
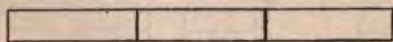
NOTE. — Each pupil should be provided with three equal strips of paper of convenient dimensions, say about 12" by 1".

1. Fold the first strip of paper into halves and the second strip into thirds.

2. Fold the third strip into halves and each half into thirds. How many equal parts in the



whole strip? Since there are six equal parts, what is each part called?



3. Compare the first strip with the third. How many sixths equal one half? How many sixths in a whole?

4. Compare the second strip with the third. How many sixths equal one third? two thirds?

Looking at the strips, write the answers of the following :

1. $\frac{1}{2} + \frac{1}{6} =$

5. $\frac{6}{6} - \frac{2}{3} =$

9. $\frac{1}{2} - \frac{1}{6} =$

2. $\frac{1}{2} + \frac{1}{3} =$

6. $\frac{6}{6} - \frac{1}{2} =$

10. $\frac{5}{6} - \frac{1}{2} =$

3. $\frac{1}{3} + \frac{1}{6} =$

7. $\frac{2}{3} - \frac{1}{2} =$

11. $\frac{5}{6} - \frac{1}{3} =$

4. $\frac{2}{3} + \frac{1}{6} =$

8. $\frac{1}{3} - \frac{1}{6} =$

12. $1 - \frac{1}{6} =$

Halves, Thirds, and Sixths

ORAL EXERCISE*

1. Add $\frac{1}{6}$, $\frac{1}{2}$, and $\frac{1}{6}$. 2. How much is $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{6}$?
 3. Find the sum of $\frac{1}{3}$, $\frac{1}{3}$, and $\frac{1}{6}$. 4. Subtract $\frac{1}{3}$ from $\frac{5}{6}$. 5. Subtract $\frac{1}{6} + \frac{1}{3}$ from 1 whole. 6. From $\frac{1}{2}$ take $\frac{1}{3}$. 7. To $\frac{1}{2}$ add $\frac{1}{3}$.

WRITTEN EXERCISE

Copy and study:

1. $\frac{2}{6} = \frac{1}{3}$.

4. $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$.

2. $\frac{4}{6} = \frac{2}{3}$.

5. $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$.

3. $\frac{3}{6} = \frac{1}{2}$.

6. $\frac{1}{2} + \frac{1}{6} = \frac{2}{3}$.

WRITTEN EXERCISE

Copy and complete:

1. $2 - \frac{1}{6} =$

5. $4\frac{5}{6} + 1\frac{1}{6} =$

9. $10\frac{5}{6} - 5\frac{1}{6} =$

2. $10 - \frac{5}{6} =$

6. $5\frac{5}{6} - 2\frac{1}{6} =$

10. $12\frac{1}{2} - 2\frac{1}{6} =$

3. $6 - \frac{2}{6} =$

7. $10 + 3\frac{5}{6} =$

11. $8\frac{2}{3} - 3\frac{1}{6} =$

4. $4 - \frac{3}{6} =$

8. $7 - \frac{1}{6} =$

12. $5\frac{1}{3} - 2\frac{1}{6} =$

WRITTEN PROBLEMS*

1. A girl used $2\frac{2}{3}$ yd. of silk to make one waist and $3\frac{1}{6}$ yd. to make another. How many yards were used for both waists?

2. A roll of carpet containing 60 yd. had a piece $34\frac{1}{2}$ yd. cut off. How many yards remained?

* These problems should be solved with the aid of diagrams, objects, or drawings; at this point no attempt should be made to teach formally the reduction of fractions to common denominator.

3. A grocer bought a *stock* of 25 doz. eggs; he sold to Mrs. Smith $3\frac{1}{6}$ doz. How many dozen were left?

4. From a piece of muslin $18\frac{5}{8}$ yd. long a piece $7\frac{1}{3}$ yd. long was cut. How many yards were left?

5. An oil dealer sold $125\frac{1}{2}$ bbl. of oil on Monday, and $256\frac{1}{6}$ bbl. on Wednesday. How many barrels did he sell in the two days?

6. A man spends $\frac{1}{2}$ of his *wages* for board and $\frac{1}{3}$ for other expenses. What part of his wages has he left?

7. Jane bought 12 yd. of silk. She used $3\frac{1}{3}$ yd. to cover a sofa pillow and $4\frac{1}{2}$ yd. to make a waist. How much did she have left?

8. A farmer had $115\frac{1}{2}$ A. in his entire farm; he had $48\frac{1}{2}$ A. in *woodland*, $20\frac{1}{2}$ A. in pasture, and the rest planted with hay. How many acres were planted with hay?

9. A farmer bought 2000 ft. of *barbed wire*; he used $857\frac{1}{3}$ ft. to fence a meadow and $256\frac{1}{3}$ ft. to fence his garden. How many feet were left?

10. A clerk earns \$17.50 a week. He spends \$9 for board, $\$11\frac{1}{2}$ for laundry, $\$3\frac{3}{4}$ for carfare, $\$1\frac{1}{4}$ for lunches, and saves the remainder for clothes and other needs. How much does he save?

FRACTIONAL PARTS OF NUMBERS

One Half of a Number



ORAL EXERCISE I

1. Cut a strip of paper 2 in. long. Fold the strip into halves and measure each half.

Then : One half of 2 in. equals 1 in.

We find $\frac{1}{2}$ of a number by dividing it into 2 equal parts. So we may find $\frac{1}{2}$ of 4 in. by dividing 4 in. by 2 ; we write this, $4'' \div 2 = 2''$.

Write : $\frac{1}{2}$ of 2 in. = 1 in.

2. Write and complete :

$\frac{1}{2}$ of 4 books =

$\frac{1}{2}$ of 6 blocks =

$\frac{1}{2}$ of 8 qt. =

$\frac{1}{2}$ of \$12 =

$\frac{1}{2}$ of 20 ct. =



3. How much is $\frac{1}{2}$ of 6 yd.? Of 8 cows? Of 10 hr.? Of 12 ft.? Of 14 da.? Of 16 qt.? Of 18 dollars?

ORAL EXERCISE

A

B

1. Line *B* is half as long as *A*; *A* is 2 in. long. How long is *B*?

2. Suppose that *B* represents 3 in. What does *A* represent?

*A**B*

3. *B* is half as large as *A*; *A* holds 8 qt. How many quarts does *B* hold?

4. *A* holds 16 lb. of seed. How many pounds of seed does *B* hold?

5. John had 10 ct., and he spent $\frac{1}{2}$ of his money. How much did he spend?

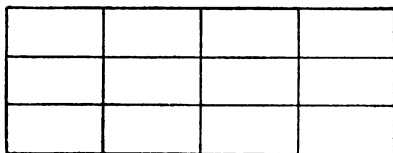
HINT. Suppose that the 10 cents were in the form of 2 five-cent nickels, then what did John spend?

How much did John have left?

6. Mary had 8 chicks, but one half of them she lost. How many were lost?

7. James bought 14 qt. of milk at the dairy, but he spilled one half of it on the way home. How many quarts were spilled?

8. How many parts in this oblong? How many parts in $\frac{1}{2}$ of the oblong?



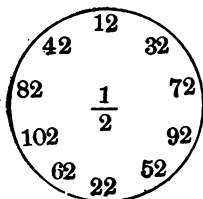
9. Divide a sheet of paper into 8 equal parts. How many parts in one half of the sheet?

10. How many parts in the other half of the sheet?

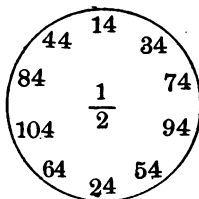
11. Find another way of dividing a sheet of paper into 8 equal parts.

One Half of a Number

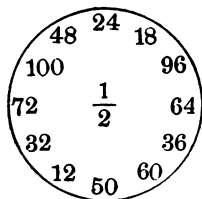
SIGHT DRILLS



Cycle of 2's.



Cycle of 4's.



Important numbers.

SIGHT EXERCISE

1. $\frac{1}{2}$ of 120 =

2. $\frac{1}{2}$ of \$ 1.00 =

3. $\frac{1}{2}$ of \$.80 =

4. $\frac{1}{2}$ of 216 =

5. $\frac{1}{2}$ of 146 =

6. $\frac{1}{2}$ of 718 =

7. $\frac{1}{2}$ of \$ 3.60 =

8. $\frac{1}{2}$ of \$ 3.20 =

9. $\frac{1}{2}$ of 612 =

10. $\frac{1}{2}$ of \$ 1.40 =

One Half of a Sum of Money

SIGHT EXERCISE

1. Find $\frac{1}{2}$ of \$9.60. 3. Find $\frac{1}{2}$ of \$5.60.
 $\frac{1}{2}$ of \$9.60 = $2 \overline{) \$9.60}$
 \$4.80 *Ans.* 4. Find $\frac{1}{2}$ of \$8.30.
 2. Find $\frac{1}{2}$ of \$16.50. 5. Find $\frac{1}{2}$ of \$12.40.

WRITTEN EXERCISE

Find $\frac{1}{2}$ of the following amounts:

- | | | |
|-------------|--------------|--------------|
| 6. \$24.50. | 9. \$17.48. | 12. \$51.00. |
| 7. \$13.58. | 10. \$36.90. | 13. \$27.18. |
| 8. \$39.20. | 11. \$92.08. | 14. \$50.12. |

ORAL PROBLEMS

1. A class of 24 pupils contains an equal number of boys and girls. How many boys in the class?
2. The milkman charges 16 ct. for 2 qt. of milk. What is the price of a quart?
3. Braid is sold at 20 ct. a yard. What must I pay for $\frac{1}{2}$ yd.?
4. My note book contains 32 pages; I have used $\frac{1}{2}$ of it. How many pages remain blank?
5. A grocer puts 22 lb. of flour into two packages of equal size. How many pounds in each package?
6. A boy's wages are 80 ct. a day. How much should he receive for working half a day?

7. A *bushel* of wheat weighs 60 lb. What is the weight of half a bushel of wheat?

8. The price of 2 tickets for the circus is 50 ct. What is the cost of one ticket?

9. The grocer sold to me 2 doz. lemons for 48 ct. What was the price of a dozen?

10. How far from one end is the middle point of a rope 42 ft. long?

WRITTEN PROBLEMS



1. A woodsman wishes to cut a pole 110 ft. long into two equal lengths. What will be the length of each piece?

2. A sheep-raiser wishes to divide his *flock* of 856 sheep into two equal flocks. How many shall he put into each flock?

3. A farmer sold $\frac{1}{2}$ of his farm of 640 A. How many acres had he left? How many acres did he sell?

4. A farmer's crop of wheat amounted to 2684 bu.; he sold $\frac{1}{2}$ of it. How many bushels did he sell?

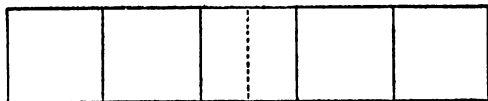
5. A man gave his wife \$45.50 to buy clothing; she spent $\frac{1}{2}$ of the money for a coat. What was the cost of the coat?

6. From the school entrance to the corner is a distance of 750 ft. How far from the entrance is the point *midway* to the corner?

7. A roll of silk containing 58 yd. was sold to two customers in equal pieces. How many yards did each customer buy?

The Half of Odd Numbers

EXERCISE



Find $\frac{1}{2}$ of 5.

5 is an odd number, so we take $\frac{1}{2}$ of 4 (1 less than 5), which is 2, and $\frac{1}{2}$ of 1, which is $\frac{1}{2}$. The answer is $2\frac{1}{2}$.

Now we do it in this way: $\frac{1}{2}$ of 5 = $2\frac{1}{2}$ *Ans.*

1. Find $\frac{1}{2}$ of 7.
3. Find $\frac{1}{2}$ of 15.
5. Find $\frac{1}{2}$ of 11.
2. Find $\frac{1}{2}$ of 9.
4. Find $\frac{1}{2}$ of 21.
6. Find $\frac{1}{2}$ of 13.
7. $\frac{1}{2}$ of 79 ft. =
9. $\frac{1}{2}$ of 185 hr. =
8. $\frac{1}{2}$ of 57 gal. =
10. $\frac{1}{2}$ of 117 da. =

1. If 2 apples cost 5 ct., what will 1 apple cost? *Ans.* $2\frac{1}{2}$ ct.

The answer is 2 ct. and a half-cent. Now you know that the cent is the smallest coin in our money, and that if you bought only one of the apples, you would have to pay 3 ct. But in arithmetic we often speak of the half-cent, because things are often sold at $12\frac{1}{2}$ ct., and at $37\frac{1}{2}$ ct., and at $62\frac{1}{2}$ ct. each.

WRITTEN EXERCISE

Find $\frac{1}{2}$ of the following amounts:

- | | | |
|-------------|-------------|---------------|
| 2. 25 ct. | 5. \$ 1.75. | 8. \$ 10.75. |
| 3. 75 ct. | 6. \$ 2.25. | 9. \$ 17.05. |
| 4. \$ 1.25. | 7. \$ 2.75. | 10. \$ 35.75. |

ORAL PROBLEMS I

1. I bought 7 lb. of sugar in 2 packages of equal weight. How much did each package weigh?

2. If I divide a piece of ribbon 15 yd. long into 2 equal pieces, how many yards will be in each piece?

3. How much should I pay for $\frac{1}{2}$ gal. of molasses worth 35 ct. a gallon?

4. An expressman charged 50 ct. for carting 2 trunks. What was the charge for each trunk?

5. A family used 17 lb. of meat in 2 weeks. How many *pounds a week* were used?

6. When silk is \$ 1 a yard, what will $\frac{1}{2}$ yd. cost?

One Third of a Number

ORAL EXERCISE

1. Cut a strip of paper 3 in. long into 3 equal parts. How long is each part?

2. What is $\frac{1}{3}$ of 3?

3. Suppose that the strip of paper which you cut into 3 equal parts had been 6 in. long. How long would each part be?

4. What is $\frac{1}{3}$ of 12?

We find $\frac{1}{3}$ of a number by dividing the number by 3.
so $\frac{1}{3}$ of 12 is 4 because $12 \div 3 = 4$.
$$\begin{array}{r} 3 \overline{)12} \\ 4 \end{array}$$
 Ans.

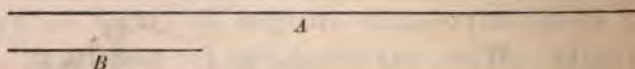
5. Suppose the strip were 9" long; what is $\frac{1}{3}$ of 9?

6. Suppose the strip were 15" long; what is $\frac{1}{3}$ of 15?

Find $\frac{1}{3}$ of the following numbers:

- | | | | |
|--------|---------|---------|---------|
| 7. 18. | 9. 30. | 11. 60. | 13. 36. |
| 8. 24. | 10. 21. | 12. 90. | 14. 48. |

ORAL PROBLEMS



1. A is 3 in. long and B is $\frac{1}{3}$ as long as A . How long is B ?

2. A yard is 3 ft. long. How long is $\frac{1}{3}$ of a yard?

3. A milkman sold 21 qt. of milk in equal *portions* to 3 customers. How many quarts did each customer buy?

4. A visitor divided equally 75 ct. among the 3 children of his *host*. How much did each child receive?

WRITTEN DRILLS

Copy and complete :

1. $\frac{1}{3}$ of 36 =

5. $\frac{1}{3}$ of 192 =

2. $\frac{1}{3}$ of 121 =

6. $\frac{1}{3}$ of 123 =

3. $\frac{1}{3}$ of 270 =

7. $\frac{1}{3}$ of 3309 =

4. $\frac{1}{3}$ of 162 =

8. $\frac{1}{3}$ of 714 =

WRITTEN PROBLEMS

1. What will $\frac{1}{3}$ yd. of *tapestry* cost at \$4.50 a yard?

2. The coal dealer charged me \$17.25 for 3 T. of coal. What was the price *per ton*?

3. A steamship used 1245 T. of coal in 3 da. How many tons a day were used?

4. A cornfield, 3 A. in extent, yielded 285 bu. of corn. What was the crop *per acre*?

5. A builder employing 3 bricklayers pays them \$16.95 a day. How much does each bricklayer receive *per day*?

6. I can buy 720 boxes of matches for \$3. How many boxes should I get for \$1?

One Fourth of a Number — One Fifth of a Number

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
$\frac{1}{4}$	$\frac{2}{8}$	$\frac{3}{12}$	$\frac{4}{16}$	$\frac{5}{20}$

ORAL EXERCISE I

A _____
 B _____
 C _____

1. Suppose that A is 4 in. long; C is $\frac{1}{4}$ as long as A . How long is C ?

2. If A represents 20 yd., how long is B ? How long is C ?

3. A roll of carpet contains 40 yd.; $\frac{1}{4}$ of it was sold. How many yards were sold?

4. There are 12 parts in this oblong. How many parts in $\frac{1}{4}$ of the oblong?

5. Jane's mother bought 12 yd. of goods from which she made 3 dresses for Jane. How many yards in each dress?

6. A peck contains 8 qt. How many quarts in $\frac{1}{4}$ of a peck?

One fourth of a peck is sometimes called a small measure.

7. If a peck measure holds 16 lb. of nuts, how many pounds does a small measure hold?

8. William had 20 ct.; he spent $\frac{1}{4}$ of the money. How many cents did he spend?

9. If William had spent $\frac{1}{5}$ of the money, how many cents would he have spent?

10. There are 40 scholars in a certain class. If $\frac{1}{5}$ of the class raise their right hands, how many right hands will be raised?

ORAL PROBLEMS

1. There are 28 children in the kindergarten; $\frac{1}{4}$ of them are boys. How many boys in the kindergarten? How many girls?

2. 20 children are playing a game; $\frac{1}{4}$ of them *squat*, the rest stand. How many are squatting?

3. There are 4 large tables for the 28 children in the kindergarten. How many children must the teacher put at each table if she wants the same number at every table?

4. 4 children received 40 splints in equal lots from the teacher. How many splints did each child receive?

5. 24 children stand in 4 rows of equal length. How many children in each row?

6. If 15 splints are placed in 5 equal rows, how many splints are there in each row?

7. 25 children are in a march, $\frac{1}{5}$ of them carry flags. How many carry flags?

8. 30 beans are divided into 3 equal piles. How many beans in each pile?

Fractional Parts of Numbers

ORAL EXERCISE

Give the answers :

1. $\frac{1}{5}$ of 5 =

8. $\frac{1}{5}$ of 60 =

2. $\frac{1}{5}$ of 10 =

9. $\frac{1}{2}$ of 50 ct. =

3. $\frac{1}{5}$ of 25 =

10. $\frac{1}{4}$ of 120 mi. =

4. $\frac{1}{5}$ of 35 =

11. $\frac{1}{5}$ of 360 min. =

5. $\frac{1}{5}$ of 40 =

12. $\frac{1}{3}$ of 72 gal. =

6. $\frac{1}{5}$ of 45 =

13. $\frac{1}{5}$ of \$ 5.50 =

7. $\frac{1}{5}$ of 50 =

14. $\frac{1}{4}$ of \$ 3.60 =

WRITTEN PROBLEMS

1. How many inches in $\frac{1}{4}$ of a yard?

2. How many minutes in $\frac{1}{3}$ of an hour?

3. There are 365 da. in a year. How many days in $\frac{1}{5}$ of a year?

4. A certain hotel uses a barrel of flour in 4 da. How many pounds are used each day?

(A barrel of flour weighs 196 lb.)

ORAL PROBLEMS

1. If 1 yd. of cloth costs \$1, what part of a dollar will $\frac{1}{2}$ yd. cost? $\frac{1}{4}$ yd.? $\frac{1}{3}$ yd.? $\frac{1}{5}$ yd.?
2. If \$1 buys 1 yd. of cloth, what part of a yard will $\$ \frac{1}{2}$ buy? $\$ \frac{1}{4}$? $\$ \frac{1}{5}$?
3. If 1 gal. of oil cost 1 di., what part of a dime will $\frac{1}{2}$ gal. cost?
4. If milk costs 8 ct. a quart, what will 1 pt. cost?
5. If prunes are 12 ct. a pound, what will $\frac{1}{2}$ lb. cost?
6. The price of butter is 40 ct. per pound. Find the cost of $\frac{1}{4}$ lb.

WRITTEN PROBLEMS

1. A farmer has 240 hills of potatoes planted in 6 equal rows. How many hills in each row?
2. If 240 hills yield 8 bu. of potatoes, how many hills yield 1 bu.?
3. If the farmer sells 9 bu. potatoes for \$5.40, what is the price per bushel?
4. The farmer pays his hired man \$10.50 for 7 da. labor. What are the hired man's wages for 1 da.?
5. A cook used a bushel of potatoes costing \$1.05 in 5 da. What was the cost per day for potatoes?

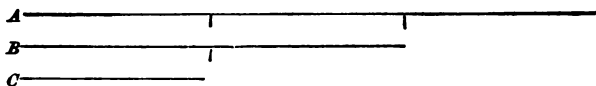
Comparisons — One Half, One Third

1. B is how many times as large as A ?
2. C is how many times as large as A ?
3. What is the size of A compared to B ? To C ?
4. If A is 1 in. tall, how tall is B ? How tall is C ?
5. If B weighs 6 lb., what does A weigh? What does C weigh?
6. If A is called 2, what is B ? What is C ?
7. If A is called 3, what is B ? What is C ?
8. If C is called 12, what is A ? What is B ?
9. Suppose A is 2, then 2 is $\frac{1}{2}$ of how many? 2 is $\frac{1}{3}$ of how many?
10. Suppose A is 3, then what part of 6 is 3? What part of 9 is 3?
11. Suppose A is 4, then 4 is $\frac{1}{2}$ of how many? 4 is $\frac{1}{3}$ of how many?
12. What part of 12 is 4? What part of 8 is 4?
13. Suppose A is 5, then 5 is $\frac{1}{2}$ of how many? 5 is $\frac{1}{3}$ of how many?
14. What part of 10 is 5? What part of 15 is 5?



Two Thirds of a Number

ORAL EXERCISE



1. A is how many times as large as C ? B is how many times as large as C ?

2. If A is 6 in. long, how long is C ? How long is B ?

3. How long is C compared with A ? How long is B compared with A ?

4. What is $\frac{1}{3}$ of 6?

5. If C is $\frac{1}{3}$ of 6, how long is B ?

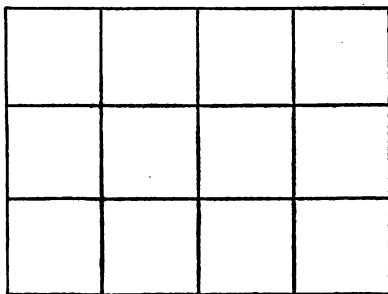
6. If $\frac{1}{3}$ of $A = 2''$, how much is $\frac{2}{3}$ of A ?

7. If A represents 9, what does B represent?

8. What is $\frac{2}{3}$ of 9?

9. How many parts in this oblong? Point out $\frac{1}{3}$

of the oblong. $\frac{2}{3}$ of the oblong.



10. How many parts in $\frac{1}{3}$ of the oblong? In $\frac{2}{3}$?

11. What is $\frac{1}{3}$ of 12? Of 18? Of 24? Of 30?

12. What is $\frac{2}{3}$ of 12? Of 15? Of 21? Of 60?

ORAL PROBLEMS

1. I wish to cut off $\frac{2}{3}$ of a piece of silk 24 yd. long. How many yards shall I cut off?
2. A pole, 36 ft. long, is to be painted white for $\frac{2}{3}$ of its length. How many feet in its length will it be painted?
3. A class *consists* of 27 pupils; $\frac{2}{3}$ of the class are girls. How many girls in the class?
4. A boy who had saved 30 ct. spent $\frac{2}{3}$ of it. How much did he spend?
5. What must I pay for $\frac{2}{3}$ of a yard of ribbon which is sold at the rate of 15 ct. a yard?

WRITTEN EXERCISE

1. What is $\frac{2}{3}$ of 123?

$$\begin{array}{r} 3 \overline{)123} \\ \underline{41} \\ 2 \\ \underline{82} \end{array}$$

41

2

82 Ans.

EXPLANATION

$$\frac{1}{3} \text{ of } 123 = 41$$

$$\frac{2}{3} \text{ of } 123 = 2 \times 41 = 82$$

Do the following problems in the same way:

- | | |
|----------------------------------|--------------------------|
| 2. What is $\frac{2}{3}$ of 150? | 4. $\frac{2}{3}$ of 240? |
| 3. What is $\frac{2}{3}$ of 189? | 5. $\frac{2}{3}$ of 954? |

WRITTEN PROBLEMS

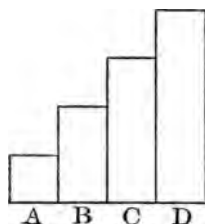
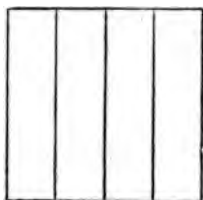
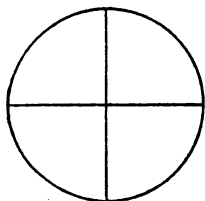
1. A box contains a gross (144) matches. How many matches in $\frac{2}{3}$ of a box?
2. What will $\frac{2}{3}$ of a yard of lace cost at \$4.50 per yard?

3. A bookdealer buys readers at the rate of \$7.80 a dozen. What must he pay for $\frac{2}{3}$ doz.?

4. What must I pay for $\frac{2}{3}$ of a ton of hay at \$17.40 a ton?

5. A man spends $\frac{2}{3}$ of what he earns. He earns \$1500 a year. How much does he spend a year?

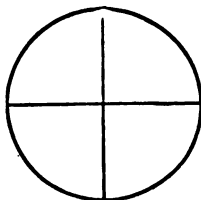
Three Fourths of a Number



1. Point out $\frac{1}{4}$ in each of these figures.
2. If *A* is 1 in. tall, how tall is *B*? *C*? *D*?
3. How many times as large as *A* is *B*? Is *C*? Is *D*?
4. How large is *A* compared with *B*? Compared with *C*? Compared with *D*?
5. How large is *A* compared with *C*? How large is *B* compared with *C*?
6. How large is *A* compared with *D*? How large is *B* compared with *D*? How large is *C* compared with *D*?

7. If the whole circle represents 20, what does $\frac{3}{4}$ of the circle represent?

8. How do you find $\frac{1}{4}$ of a number? $\frac{2}{4}$ of a number? $\frac{3}{4}$ of a number?



9. How do you find $\frac{1}{3}$ of a number? $\frac{2}{3}$ of a number?

ORAL DRILLS

1. What is $\frac{1}{4}$ of 20? $\frac{3}{4}$ of 20?
2. Think of 32. What is $\frac{1}{4}$ of 32? $\frac{3}{4}$ of 32?
3. Think of 40. What is $\frac{1}{4}$ of 40? $\frac{3}{4}$ of 40?
4. How much is $\frac{3}{4}$ of 12? $\frac{3}{4}$ of 16? $\frac{3}{4}$ of 8?
5. Find $\frac{3}{4}$ of 24.
6. What is $\frac{1}{4}$ of 400? $\frac{3}{4}$ of 400?
7. What is $\frac{1}{4}$ of 4000? $\frac{3}{4}$ of 4000?

ORAL PROBLEMS

1. A standing post 24 ft. long has $\frac{1}{4}$ of its length buried in the ground. How many feet are above the ground?
2. John is 16 yr. old; his sister Kate is $\frac{3}{4}$ as old. How old is Kate?
3. Mary had 12 chicks; she lost $\frac{1}{4}$ of them. How many has she left?

4. The flag pole is 40 ft. high ; the apple tree is $\frac{3}{4}$ as high. How high is the apple tree ?

5. What will $\frac{3}{4}$ of a peck of potatoes cost at 28 ct. a peck ?

WRITTEN EXERCISE

1. What is $\frac{3}{4}$ of 156 ?

$$\begin{array}{r} 4 \overline{)156} \\ \underline{39} \\ 3 \\ \underline{117} \text{ Ans.} \end{array}$$

EXPLANATION

$$\frac{1}{4} \text{ of } 156 = 39$$

$$\frac{3}{4} \text{ of } 156 = 3 \times 39 = 117$$

2. Find $\frac{3}{4}$ of 296.

8. How much is $\frac{3}{4}$ of 516 bu. ?

3. Find $\frac{3}{4}$ of 360.

4. Find $\frac{3}{4}$ of 1200.

9. How much is $\frac{3}{4}$ of 1644 lb. ?

5. What is $\frac{3}{4}$ of 4508 ?

10. How much is $\frac{3}{4}$ of \$20.96 ?

6. What is $\frac{3}{4}$ of 7216 ?

7. What is $\frac{3}{4}$ of 6572 ?

11. How much is $\frac{3}{4}$ of \$48.08 ?

WRITTEN PROBLEMS

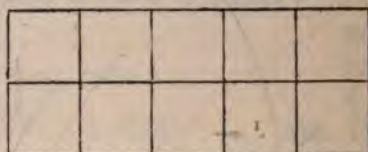
1. What must I pay for $\frac{3}{4}$ of a gallon of olive oil, worth \$1.24 a gallon ?

2. In a place where farm land is valued at \$60 an acre, what should I pay for $\frac{3}{4}$ A. ?

3. A man is trying to save \$900 a year. How much should he save in $\frac{3}{4}$ year?

4. What must I pay a carpenter for $\frac{3}{4}$ of a day's work, when his *rate of wages* is \$3.60 per day?

Two Fifths, Three Fifths, Four Fifths of Numbers



Point out $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{5}{5}$.

Into how many squares is the oblong divided?

How many squares is $\frac{1}{5}$ of 10 squares? $\frac{2}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? $\frac{5}{5}$?

How many times $\frac{1}{5}$ is $\frac{2}{5}$? Is $\frac{3}{5}$? Is $\frac{4}{5}$? Is $\frac{5}{5}$?

How can you find $\frac{1}{5}$ of a number? $\frac{2}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? $\frac{5}{5}$?

What is $\frac{1}{5}$ of 30? $\frac{2}{5}$ of 30? $\frac{3}{5}$ of 30? $\frac{4}{5}$ of 30?

ORAL DRILLS

Find $\frac{2}{5}$ of 40. Of 60. Of 75. Of 20.
Of 25. Of 35.

Find $\frac{3}{5}$ of 10 ct. Of 40 qt. Of 75 bu. Of 30 pk. Of 25 ct. Of 35 yd.

Find $\frac{4}{5}$ of 10 in. Of 20 doz. Of 80 da. Of 75 A. Of \$100. Of \$500. Of \$5000.

ORAL PROBLEMS

1. How many yards must I cut from a piece of cloth measuring 40 yd. to get $\frac{2}{5}$ of the piece?
2. The railroad *fare* to a certain city is \$5. What is the fare for $\frac{3}{5}$ of the distance?
3. There are 50 pages in my note book; I have used $\frac{3}{5}$ of them. How many have I used?
4. What must I pay for $\frac{4}{5}$ of a barrel of sugar, worth \$10 a barrel?

WRITTEN EXERCISE

1. What is $\frac{3}{5}$ of 420?

$$\begin{array}{r} 5 \overline{)420} \\ 84 \\ \underline{3} \\ 252 \end{array}$$

$$84$$

$$3$$

$$252 \text{ Ans.}$$

EXPLANATION

$$\frac{1}{5} \text{ of } 420 = 84$$

$$\frac{3}{5} \text{ of } 420 = 3 \times 84 = 252$$

- | | |
|---------------------------------------|--------------------------------|
| 2. Find $\frac{4}{5}$ of 255. | 13. $\frac{3}{5}$ of 2200 ft.? |
| 3. Find $\frac{2}{5}$ of 720. | 14. $\frac{3}{5}$ of \$82.55? |
| 4. Find $\frac{3}{5}$ of 2150. | 15. $\frac{4}{5}$ of \$2500? |
| 5. What is $\frac{3}{4}$ of \$5.60? | 16. $\frac{4}{5}$ of 3000 mi.? |
| 6. What is $\frac{3}{4}$ of \$3.60? | 17. $\frac{4}{5}$ of \$86.05? |
| 7. What is $\frac{3}{4}$ of \$4.80? | 18. $\frac{1}{6}$ of 120? |
| 8. What is $\frac{3}{4}$ of \$7.20? | 19. $\frac{1}{6}$ of 216? |
| 9. What is $\frac{2}{5}$ of 120? | 20. $\frac{1}{6}$ of 672? |
| 10. What is $\frac{2}{5}$ of 340? | 21. $\frac{5}{6}$ of \$1.50? |
| 11. What is $\frac{2}{5}$ of 750? | 22. $\frac{5}{6}$ of \$35.28? |
| 12. What is $\frac{3}{5}$ of \$17.50? | 23. $\frac{5}{6}$ of \$91.44? |

WRITTEN PROBLEMS I

1. A farmer had 120 sheep; he sold $\frac{5}{8}$ of them. How many did he sell?

2. He received \$524 for the sheep which he sold, and he put $\frac{3}{4}$ of the money into the *bank*. How much did he put into the bank?

3. After paying *expenses*, the farmer had \$110 left in cash; he spent $\frac{3}{5}$ of it for a horse. What was the cost of the horse?

4. The farmer has 180 A. in his farm; $\frac{2}{3}$ of it is a sheep pasture. How many acres in the sheep pasture?

5. In an *orchard* containing 420 trees, $\frac{1}{2}$ are apple trees, $\frac{1}{3}$ are pear trees, and $\frac{1}{6}$ are plum trees. How many trees of each kind in the orchard?

WRITTEN PROBLEMS II

1. In making a *journey* of 1200 mi., a man traveled $\frac{5}{8}$ of the way by boat, and the rest of the way by railroad. How long was his journey by boat?

2. A merchant *deposited* \$6500 in the bank, $\frac{3}{5}$ of the amount was in bills, the rest in silver. How much money was in bills? How much in silver?

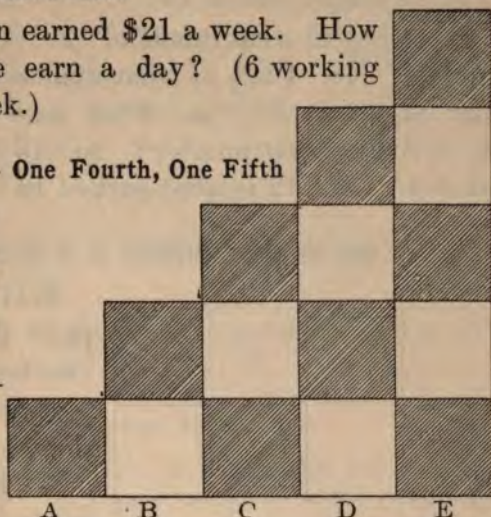
3. There are 5280 ft. in a mile. How many feet in $\frac{3}{4}$ of a mile?

4. A cattle raiser had 1560 *head* of cattle; he sold $\frac{2}{3}$ of them. How many did he sell? How many did he have left?

5. A mason earned \$21 a week. How much did he earn a day? (6 working days to a week.)

Comparisons—One Fourth, One Fifth

				3
			3	3
		3	3	3
	3	3	3	3
3	3	3	3	3
<hr/>				
3	6	9	12	15



- | | |
|--|--------------------------------------|
| 1. 3 is $\frac{1}{4}$ of what number? | 1. Compare <i>A</i> with <i>D</i> . |
| 2. 3 is $\frac{1}{5}$ of what number? | 2. Compare <i>A</i> with <i>E</i> . |
| 3. What part of 15 is 3? | 3. Compare <i>A</i> with <i>E</i> . |
| 4. What part of 12 is 3? | 4. Compare <i>D</i> with <i>A</i> . |
| 5. What part of 9 is 3? | 5. Compare <i>A</i> with <i>C</i> . |
| 6. What is $\frac{3}{4}$ of 12? | 6. Compare <i>C</i> with <i>D</i> . |
| 7. What is $\frac{3}{5}$ of 15? | 7. Compare <i>C</i> with <i>E</i> . |
| 8. 6 is $\frac{1}{2}$ of what number? | 8. Compare <i>B</i> with <i>D</i> . |
| 9. 6 is $\frac{2}{3}$ of what number? | 9. Compare <i>B</i> with <i>C</i> . |
| 10. 6 is $\frac{2}{5}$ of what number? | 10. Compare <i>E</i> with <i>B</i> . |
| 11. What part of 15 is 9? | 11. Compare <i>E</i> with <i>C</i> . |

12. Suppose A is 4, then what is B ? What is C ? What is D ? What is E ?

13. 4 is what part of 12? Of 16? Of 8? Of 20?

14. 4 is $\frac{1}{3}$ of what number? 15. 4 is $\frac{1}{5}$ of what number? 16. 4 is $\frac{1}{4}$ of what number? 17. What part of 12 is 8? 18. What part of 20 is 8? 19. 8 is $\frac{2}{3}$ of what number? 20. 16 is $\frac{4}{5}$ of what number? 21. 12 is what part of 16?

One or More Eighths of a Number



Fold a sheet of paper the short way into fourths.

Spread out the sheet and then fold it the long way into halves.

ORAL EXERCISE

- How many parts in the whole sheet?
- What is each part called?
- Point out $\frac{1}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{7}{8}$.
- How many eighths in $\frac{1}{2}$ of the whole sheet? In $\frac{1}{4}$ of the whole sheet?
- How many eighths in $\frac{1}{8} + \frac{2}{8}$? In $\frac{4}{8} + \frac{3}{8}$? In $\frac{5}{8} - \frac{2}{8}$? In $1 - \frac{1}{8}$? In $1 - \frac{3}{8}$? In $1 - \frac{5}{8}$?
- If the whole sheet represents 16, what does $\frac{1}{8}$ represent? $\frac{3}{8}$? $\frac{5}{8}$? $\frac{7}{8}$?

7. If the whole sheet represents 40, what does $\frac{1}{8}$ represent? $\frac{2}{8}$? $\frac{3}{8}$? $\frac{4}{8}$? $\frac{5}{8}$? $\frac{6}{8}$? $\frac{7}{8}$?



8. Find $\frac{1}{8}$ of the following numbers, and give $\frac{3}{8}$, or $\frac{5}{8}$, or $\frac{7}{8}$, as called for by the teacher: 48, 32, 56, 72, 64, 96, 88.

To be drawn on the blackboard.

WRITTEN DRILL

1. Find $\frac{3}{8}$ of the following numbers: 120, 256, 960, 1200, 1560.

2. Find $\frac{5}{8}$ of the following amounts: \$12.56, \$18.72, \$2400, \$1.68, \$147.20.

WRITTEN PROBLEMS

1. A merchant bought a *cargo* of coal containing 1200 T. He sold $\frac{5}{8}$ of it to a steamship company. How many tons did the steamship company buy from him?

2. Some schoolboys wished to lay out a straight running course for $\frac{3}{8}$ of a mile. What number of feet must there be in the length of the course?

(A mile contains 5280 ft.)

3. A fruit dealer bought a carload of bananas, 8,000 in number; he sold $\frac{5}{8}$ of them, but the rest were spoiled. How many were spoiled?

4. The schoolhouse is $\frac{5}{8}$ as tall as the flag pole, which is 72 ft. tall. How tall is the schoolhouse?

MEASURES

Liquid Measure — Pint, Quart, Gallon

2 pints (pt.) = 1 quart (qt.)

4 quarts = 1 gallon (gal.)



Name 5 liquids that are sold in the grocery store by liquid measure.

ORAL PROBLEMS

1. At the rate of 3 ct. a pint, how much will a quart of milk cost? How much will 3 qt. of milk cost?
2. At 5 ct. a pint, how much must I pay for 2 qt. of vinegar?
3. Mary bought a quart and a pint of milk. How many pints of milk did she buy?

WRITTEN PROBLEMS

1. A pint of olive oil costs 25 ct. What is the cost of 15 qt. of olive oil?

2. A quart of cream may be bought at a dairy for 50 ct. What must I pay for 6 gal. of cream?

3. A grocer had 10 gal. of cider. He sold it at 8 ct. a quart. How much did he receive for the cider?

4. The tank on our roof holds 58 gal. of water. The people in the house use 33 gal. How many quarts of water are still left in the tank?

5. Alice went to market one day. She bought enough vinegar to fill a bottle holding 1 gal. How much did the vinegar cost at 12 ct. a quart?

Approximations

(Test after each estimate)

1. Estimate the quantity of ink in the ink bottle; in the teacher's ink well; in your own ink well.

2. How much water will your drinking glass hold?

3. Select other vessels that are used to contain liquids. Estimate the amount of liquid contained in each vessel.

Dry Measure — Pint, Quart, Peck

Name 5 articles sold by dry measure.

2 pints (pt.) = 1 quart (qt.)

8 quarts = 1 peck (pk.)

**WRITTEN PROBLEMS**

1. Your mother gives you 30 ct. with which to buy string beans. String beans are 10 ct. a quart. How many pints can you buy?
2. If tomatoes sell for 5 ct. a quart, how much will 3 pk. cost?
3. A grocer sells 214 qt. of dried beans. If he charges 3 ct. a pint, how much money will the grocer receive?

$$4 \text{ pecks (pk.)} = 1 \text{ bushel (bu.)}$$

ORAL EXERCISE

1. Take a peck measure and fill it with sawdust. With this peck measure used as often as necessary, fill the bushel measure with sawdust. Count the number of pecks of sawdust used to fill the bushel. How many pecks make a bushel?

2. How many quarts in a bushel? How many pints in a bushel? Give a reason for each answer.

ORAL PROBLEMS

1. A peck of apples costs \$1. How much do 2 bu. of apples cost?

2. Potatoes are sold in the market for \$2 a bushel. How much must I pay for 2 pk.?

(HINT. *Two pecks are what part of a bushel?*)

3. How many pecks of apples are needed to fill 8 bu.?

4. A man wishes to buy 2 bu. of onions. His grocer has only 6 pk. of onions. How many pecks of onions must the man buy at another store?

5. How many bushels in 36 pk. of peas?

6. How many quarts in 3 bushels of oats?

7. At 10 ct. a quart, how much will a bushel of cranberries cost?

Review of Liquid and Dry Measures

WRITTEN PROBLEMS

Grocery List

Milk	8 ct. per quart
Vinegar	5 ct. per quart
Salad oil	20 ct. per pint
Molasses	10 ct. per pint
Cider	12 ct. per quart
Cream	20 ct. per pint
Potatoes	8 ct. per quart
Spinach	6 ct. per quart
String beans	8 ct. per quart
Peas	10 ct. per quart
Dried peas	6 ct. per quart
Apples	15 ct. per quart
Peaches	16 ct. per quart
Cranberries	15 ct. per quart
Tomatoes	12 ct. per quart

PROBLEMS

(Use above list of prices in the following problems)

1. How much will a gallon of milk cost?
2. How much will 3 qt. of vinegar cost? How much will a gallon of vinegar cost?
3. How much will a quart of oil cost? How much will 3 gal. of oil cost?
4. How much will 2 qt. of molasses cost? How much will a gallon of molasses cost?

5. Find the cost of a pint of cider. How much will the grocer receive for a gallon of cider? For 3 qt. of molasses?

6. How much will a quart and a pint of cream cost? I will pay the dairyman — for a gallon of cream.

7. A quart of potatoes costs —. How much does a peck of potatoes cost? How much does a bushel cost?

8. The grocer will charge me — for a peck of spinach. How much will 3 qt. of spinach cost? How much will 3 bu. cost?

9. I buy a quart of potatoes, a quart of milk, a quart of peaches. How much is my bill at the grocer's?

10. How much are dried peas per quart? Find the cost of a peck of dried peas; of 2 bu.

11. The grocer will charge me — for a peck of apples; for 4 bu.

MORE DIFFICULT PROBLEMS

12. Mother bought 2 bu. of peaches. How much did she pay the grocer?

13. Find the cost of a peck and 2 qt. of peaches; of 2 bu. and 1 qt.

14. Find the selling price of a peck of cranberries; of 3 bu. and 1 qt.

Table of Length—Inch, Foot, Yard

INCH	

12 inches (in. or ")	= 1 foot (ft. or ')
3 feet	= 1 yard (yd.)

ORAL DRILL

1. How many inches are there in a foot?
2. How many feet are there in a yard?
3. What part of a yard is a foot? 2 ft. are what part of a yard?
4. How many feet are there in 2 yd.? In 3 yd.? In 4 yd.? In 5 yd.? In 8 yd.?

ORAL PROBLEMS

1. John had a stick a foot long. What is the length of the stick in inches?
2. William had a rope 3 ft. long. How many yards long was it?
3. If Mary's doll is 12 in. high, what is the doll's height in feet?
4. If lumber is 5 ct. a foot, what will a board 1 yd. long cost?

WRITTEN PROBLEMS

1. John has a rope that is 43 yd. long. How many feet long is the rope?
2. Mary had a spool which had 150 ft. of cotton on it. How many yards of cotton were on the spool?



Approximations

(Test all lengths after you have given the answer)

1. What is the length of your desk ?
2. How long is the teacher's desk ?
3. Tell the objects in the room whose length is 1 ft. Tell the objects whose length is 5 ft. ?
4. Compare the length and the height of the window.
5. Ask your neighbor to stand. How tall is he ? How tall is the tallest child in the class ? The smallest child ?
6. Draw a line about 4 in. long ; 3 ft. long ; $\frac{1}{2}$ " long ; $\frac{1}{4}$ " long.
7. Measure the length of each wall of the room.
8. Find the total length of the wainscot around the room.

Table of Weights**16 ounces (oz.) = 1 pound (lb.)****WRITTEN EXERCISE**

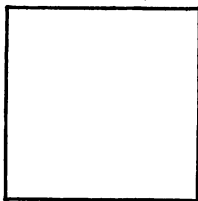
1. How many 5-oz. bags of salt may be filled from 3 bbl. of salt? (*A barrel of salt weighs 200 lb.*)
2. How many ounces are there in 9 lb.?
3. How many ounces are there in $\frac{1}{2}$ of a pound?
In $\frac{1}{4}$ of a pound? In $\frac{1}{8}$ of a pound?
4. Add 4 oz., 6 oz., 2 oz., 1 oz., 3 oz., and 11 lb. Write your answer in pounds.
5. How many pounds in 385 oz.?
6. Find the cost of 5 lb. of coffee at 30 ct. a pound.
7. If 4 lb. of rice costs 52 ct., what will $\frac{1}{2}$ lb. of rice cost?
8. Find the cost of 4 lb. of pepper, if an ounce costs 8 ct.
9. If one bag of flour contains 9 lb., how many ounces of flour are there in the bag?
10. What must I pay for 35 lb. of allspice at 7 ct. an ounce?

Approximations**(Test each weight after you have given an approximate answer)**

Give exercises in estimating the weights of books, pointers, boxes of chalk, bottles of ink, and other familiar objects.

Surface and Area

1. Name 5 objects with *flat surfaces*.
2. Name 5 objects with *curved* or *round surfaces*.
3. Which is the larger, the surface of your desk or the surface of the teacher's desk?
4. Which is the smaller, the surface of the blackboard or the surface of the ceiling?
5. Using a sheet of paper as a *measuring unit*, find how many times its surface is contained into the surface of your desk.
6. Using a larger sheet of paper, find how many times as large as its surface is the surface of the blackboard.
7. How long is the inch square?
How wide?
8. Are its sides equal or unequal?
9. What kind of angles are its corners?



ONE-INCH SQUARE

A square corner is called a right angle.

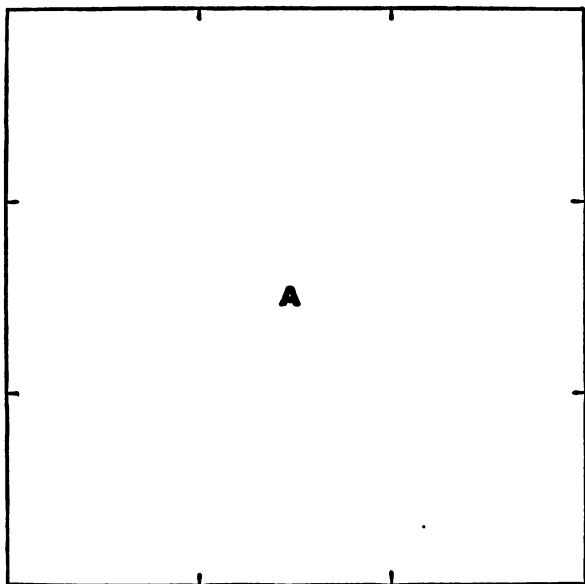
The length and width (or breadth) of a surface are called the *dimensions* of the surface.

By the **area** of a surface, we mean the size of a surface.

To measure surfaces, the inch square may be used as the measuring unit.

Area of 1 inch square = 1 square inch (sq. in.)

Areas of Rectangles



1. In the picture on page 211, B is a strip 3 in long and 1 in. wide. How many times is C contained in B ? What part of B is C ?
2. If B were 4 in. long, how many times would it contain C ?
3. How many square inches would B contain, if the length of B were made 6 in.? 8 in.? 12 in.?
4. How long is A ? How wide?
5. How many times is B contained in A ? What part of A is B ?

6. How many square inches in A ?

EXPLANATION. A contains 3 strips of B 's size; therefore the area of A is 3 times the area of B , or 3 times 3 sq. in., or 9 sq. in.

7. If A were 4 in. wide, how many strips of B 's size would it contain? How many square inches would it contain?

8. What would A 's area be, if A were 5 in. wide? 6 in.? 8 in.?

Forming Rectangles with Inch Squares

1. From a sheet of paper, cut out 12 one-inch squares.

2. Place 2 one-inch squares together. How long is the rectangle formed in this way? How wide is it? How many square inches in this rectangle? How is this area found?

3. Place 4 one-inch squares together, 2 in 1 row, and 2 above that row. How long is this large square? How wide is it? How many one-inch squares are there in this rectangle? Count them. What then is the area of this rectangle?

4. Place the 4 one-inch squares in a row. How long is this rectangle? How wide is it?



STRIP B

EXERCISE

1. Draw a rectangle 5 in. long and 4 in. wide.

We call this a rectangle 5 in. *by* 4 in.

2. Into how many strips 5 in. by 1 in. may this rectangle be divided? What part of the whole rectangle is 1 strip?

3. How many square inches are there in 1 strip?
In the whole rectangle?

4. Into how many strips 4 in. by 1 in. may the rectangle be divided? What part of the whole rectangle is 1 strip?

5. How many square inches are there in one of these strips? How many square inches are there in the whole rectangle?

We may find the area of a rectangle by dividing it into strips 1 in. wide and multiplying the area of 1 strip by the number of strips.

Find the area of the following rectangles:

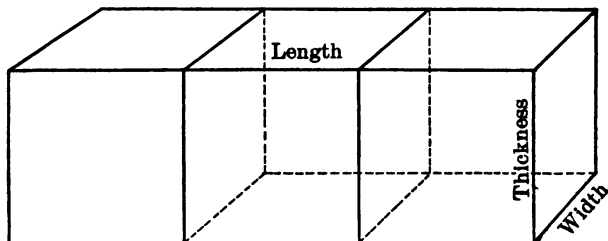
- | | |
|-------------------|---------------------|
| 6. 6 in. by 3 in. | 10. 7 in. by 5 in. |
| 7. 6 in. by 4 in. | 11. 8 in. by 10 in. |
| 8. 6 in. by 5 in. | 12. 1 ft. by 6 in. |
| 9. 5 in. by 3 in. | 13. 2 ft. by 3 in. |

14. A rectangle contains 10 sq. in., and it is 5 in. long. How wide is the rectangle?

Measuring with Inch Cubes**ORAL EXERCISE**

1. Look at an inch cube. How many edges has it? How many sides has it? Measure each edge. How long is each?

2. Make a solid with 3 inch cubes. Measure the length of this solid. Measure the width. Measure the thickness.



3. With 4 inch cubes make a solid that is 4 in. long. Take 4 more inch cubes and make another row. How many inch cubes are there in this solid? How thick is this solid? How long is it? How wide?

4. How many more inch cubes do you need to make a solid 2 in. long, 3 in. wide, and 1 in. thick, than to make a solid 1 in. long, 3 in. wide, and 1 in. thick? (*Actually construct the solids with inch cubes.*)

5. Name some things you have seen that are inch cubes. Name some solids you have seen that could be cut into inch cubes.

ORAL PROBLEMS

1. A box is 3 in. long, 2 in. wide, and 1 in. thick. How many inch cubes can I put into this box?
2. There are 6 rows of caramels in a box. Each row contains 5 caramels. How many caramels are there in this box?
3. How many inch cubes can I cut from a piece of wood 4 in. long, 2 in. wide, and 2 in. thick?
4. Put 5 inch cubes together in 1 row. How long is this solid? How wide is it? How thick is it?
5. Make a box of pasteboard 4 in. long, 3 in. wide, and 3 in. high. Count the number of inch cubes that you can put into this box.

WRITTEN PROBLEMS

1. A piece of wood measures 14 in. in length, 5 in. in width, and 7 in. in thickness. Find the number of inch cubes in this piece of wood.
2. How many inch cubes of sugar can I put into a box 5 in. long, 8 in. wide, and 9 in. high?
3. A candy box contains 26 inch cubes. How many inch cubes can I put into 8 boxes?
4. I can put 8 caramels into a small box. How many of these boxes shall I need for 408 caramels?
5. A large cube of wood measures 5" each way. Find the *contents* of this cube.

Reading the Clock

A clock has two pointers or hands. The long hand is called the minute hand; the short hand is called the hour hand.

There are 60 min. in an hour. The short hand passes over one of the spaces, *e.g.* from I to II, in 1 hr.

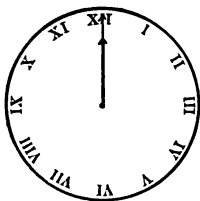


Fig. 1

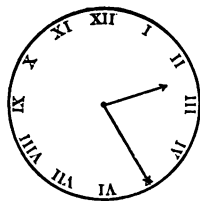


Fig. 2

1. What time is it in Figure 1? Figure 2? Figure 3? Figure 4?

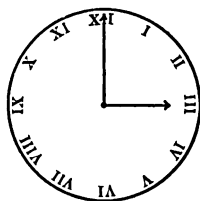


Fig. 3

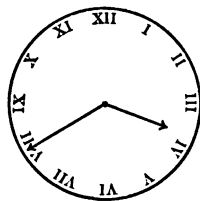


Fig. 4

2. What time is it if:

The long hand is at VI, and the short hand is between II and III? The long hand is at VIII, and the short hand is between V and VI? The long hand is at XII, and the short hand is at VIII? The long hand is at III, and the short hand is between IX and X? The long hand is at VI, and the short hand is between VI and VII?

3. How many minutes from twenty minutes past three to five minutes of four?

Table of Time

There are 12 months in a year. They are:

January, which has 31 da.

JANUARY						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February, which has 28 da. (in leap years 29 da.).

March, which has 31 da.

April, which has 30 da.

May, which has 31 da.

June, which has 30 da.

July, which has 31 da.

August, which has 31 da.

September, which has 30 da.

October, which has 31 da.

November, which has 30 da.

December, which has 31 da.

There are 7 da. in a week. Name them.

There are 52 wk. in a year. There are 365 da. in a year (in leap years 366 da.). A leap year occurs once in 4 yr. The year 1908 was a leap year.

WRITTEN EXERCISE

1. Write to-day's date. Now write the date for this day next month; the date for this day next year.

2. How many hours are there in 3 da.? In 8 da.?

3. How many days are there in 24 wk.?

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